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NAVAL SHIP RESEARCH AND DEVELOPMENT CENTER

Bethesda, Maryland 20034



THE BANDIT COMPUTER PROGRAM FOR THE REDUCTION OF MATRIX BANDWIDTH FOR NASTRAN

Gordon C. Everstine

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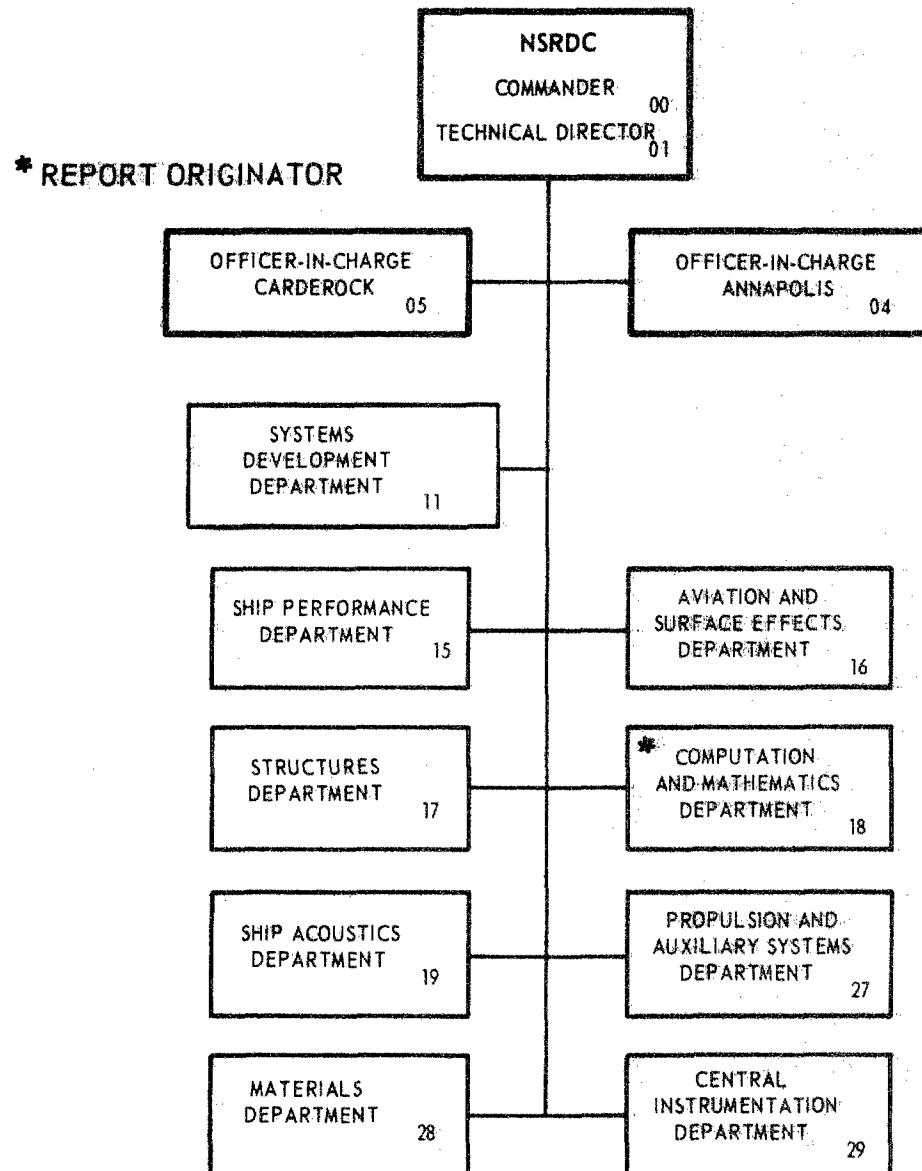
COMPUTATION AND MATHEMATICS DEPARTMENT
RESEARCH AND DEVELOPMENT REPORT

20070119043

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Naval Ship Research and Development Center
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REDUCTION OF MATRIX BANDWIDTH FOR NASTRAN

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ABSTRACT

This report describes a matrix bandwidth reduction preprocessor for use with the NASA structural analysis computer program, NASTRAN. Called BANDIT, the program is written in FORTRAN and uses the Cuthill-McKee strategy for resequencing grid points. Versions of the program for both CDC and other computers are presented.

ADMINISTRATIVE INFORMATION

The work reported herein was carried out under Task Area ZR 014 02 01.

I. INTRODUCTION

The NASA structural analysis computer program, NASTRAN, is a large general purpose program gaining wide acceptance in the Navy for the solution of both static and dynamic structural problems.

Since NASTRAN uses the finite element displacement method, the structural matrices which are formed are symmetric and sparse. With a suitable choice of the numbers (labels) assigned to the grid points, the matrices are also banded (i.e., the non-zero entries in each matrix are clustered about the main diagonal). For this reason, many of the routines used by NASTRAN for the solution of linear equations and for the extraction of eigenvalues operate most efficiently when the band-widths of the structural matrices are minimum. Indeed, the number of calculations required in such routines is $O(n b^2)$, where n is the matrix order and b is the matrix bandwidth.

Although it is essential to the NASTRAN user to have matrices with small bandwidth, NASTRAN currently places the burden on the user to number his structure so as to provide such a bandwidth. The inherent difficulties in sequencing nodal labels manually and the increasing use of automatic data generators make this an excessive and unnecessary burden for most structural analysts.

NASTRAN currently allows the user to include in his input data deck a set of cards referred to as SEQGP cards. These cards define a look-up table giving the correspondence between the original grid numbers used in defining the problem and a new set of numbers to be used internally for all calculations.

This report describes a FORTRAN computer program called **BANDIT** which can be used as a preprocessor to the NASTRAN program to automatically resequence the grid point numbers for reduced bandwidth. Using a standard NASTRAN data deck as input, **BANDIT** resequences the numbering for reduced bandwidth, if possible, and generates a set of SEQGP punch cards for insertion into the NASTRAN deck.

The renumbering strategy used in **BANDIT** is that developed by Cuthill and McKee¹. The need to resort to "strategies" becomes evident when one considers that n grid points (or nodes)² can be sequenced in $n!$ distinct ways. Thus, with any strategy, there is no guarantee that an optimum numbering (i.e., one yielding minimum bandwidth) will be achieved. However, of several strategies tested³ to date, the Cuthill-McKee approach¹ appears to be the most consistent for the reduction of matrix bandwidth for the classes of structures of prime interest to the Navy.

The computer program described herein was developed primarily for use on CDC 6400/6600 computers and hence has some machine-dependent features. However, for use on other computers, a machine-independent (and slightly less versatile) version of **BANDIT** is also described.

1 Cuthill, E. H. and J. M. McKee, "Reducing the Bandwidth of Sparse Symmetric Matrices," Proceedings of the 24th National Conference ACM 1969, pp. 157-172.

2 Throughout this report, "grid point" and "node" are used interchangeably.

3 "Sparse Matrices and Their Applications," Edited by D. J. Rose and R. A. Willoughby, Plenum Press, New York (1972), "Several Strategies for Reducing the Bandwidth of Matrices," (E. H. Cuthill), pp. 157-166.

II. USE OF THE BANDIT PROGRAM

Throughout this and subsequent sections, it is assumed that the reader is familiar with the use of the NASTRAN structural analysis computer program⁴.

BANDIT's primary reason for existence is the generation of the NASTRAN SEQGP data cards to effect low matrix bandwidth. As a by-product, BANDIT can also be used to right-adjust the NASTRAN bulk data. In either case, following the execution of BANDIT, the complete right-adjusted data deck is available on disk file. In addition, the user can elect to have punch card output for either the entire deck or the SEQGP cards alone.

The input data deck for BANDIT consists of a standard NASTRAN data deck (ID card through ENDDATA card, inclusive) with the addition of appropriate BANDIT option cards somewhere before the BEGIN BULK card. These cards, called \$-option cards, indicate to BANDIT the user's choice of options, i.e., what the user wants BANDIT to do. The \$-option cards are listed and described in detail in the next section.

On CDC machines, BANDIT functions as a variable-core program. Hence it is essentially open-ended with respect to the number of grid points that can be handled. During execution, the system is interrogated to determine the field length (amount of core). The dimensions of key arrays are then set so as to fill the available core. As a result, BANDIT must be executed on CDC machines with "NOREDUCE." in effect in order to prevent the automatic reduction of field length after the program is loaded.

4 "The NASTRAN User's Manual," edited by C.W. McCormick, NASA SP-222, September 1970.

BANDIT will load and execute in less than 50000_8 ⁵ words of core. With this field length, typical structures with less than 500 grid points can be handled. For larger structures, more core may be needed, in which case BANDIT so informs the user. It has been our experience, however, that rarely are more than 60000_8 words needed. A more detailed discussion of core requirements appears in Section V.

Although BANDIT will accept an entire NASTRAN deck as input, resequencing requires only the following NASTRAN cards: BEGIN BULK, ENDDATA, and all "connection" cards. In particular, GRID cards are not used by BANDIT. The current list of connection cards which BANDIT recognizes is given in Table 1.

BANDIT will accept data on either short or long field data cards. The only restriction to the data concerns sorting. Since BANDIT does not sort the bulk data deck, each continuation to a connection card must immediately follow the parent card. Normally, however, unless long field cards are being used, each logical connection card consists of only one physical card.

If the user so indicates, BANDIT will process all multi-point constraint (MPC) cards present. While NASTRAN MPC's refer to individual degrees of freedom, BANDIT considers only grid points. Thus, each dependent point appearing in an MPC relation is eliminated from the connection table. Additional connections are also generated between each independent point in the constraint equation and every other point to which the dependent point was previously connected.

5 The subscript "8" in this context means "base 8".

TABLE 1 - CONNECTION CARDS RECOGNIZED BY BANDIT

CBAR	CIS2D4	CQUAD2
CCONEAX	CIS2D8	CQUAD3
CDAMP1	CIS3D8	CROD
CDAMP2	CIS3D20	CSHEAR
CDAMP3	CISH8	CTETRA
CDAMP4	CISH16	CTORDRG
CELAS1	CMASS1	CTRAPRG
CELAS2	CMASS2	CTRBSCL
CELAS3	CMASS3	CTRIA1
CELAS4	CMASS4	CTRIA2
CFLUID2	CONM1	CTRIARG
CFLUID3	CONM2	CTRMEM
CFLUID4	CONROD	CTRPLT
CHEXA1	CQDMEM	CTUBE
CHEXA2	CQDPLT	CTWIST
CHTRRI2	CQUAD1	CVISC

It should be emphasized that only in rare cases would it make sense to let BANDIT process MPC's. The main reasons for this are that BANDIT does not consider individual degrees of freedom and, in addition, cannot distinguish one MPC "set" from another. Moreover, the effects of MPC's might be better handled by NASTRAN's active column feature.

The whole question of NASTRAN active columns complicates the bandwidth reduction problem, since there are clearly cases in which certain grid points should be relegated to active columns. An example might be the grid points common to both the fuselage and a wing on an airplane. If the user is able to identify such points, he can indicate them to BANDIT using the \$IGNORE card described in the next section. This BANDIT feature, like the MPC feature, will probably find only occasional use.

Following the successful completion of a BANDIT run, whether resequencing was performed or not, the entire NASTRAN deck is contained on a file called TAPE8 (logical unit 8 on some machines). If resequencing has been performed, this file includes the SEQGP cards generated. These cards are inserted into the bulk data deck before the first card whose mnemonic would alphabetically follow "SEQGP". Thus, for a NASTRAN deck already properly sorted, the block of SEQGP cards will be inserted into its proper place. On machines such as the IBM 360, whose collating sequence is opposite to that on the CDC 6400, modification of the coding is needed for proper placement.

III. THE \$-OPTION CARDS

The input data deck for BANDIT consists of a standard NASTRAN data deck (ID card through ENDDATA card, inclusive) with the addition of appropriate BANDIT option cards somewhere before the BEGIN BULK card. These option cards take the form of NASTRAN comment cards, i.e., a card with a dollar sign (\$) in card column #1.

The BANDIT \$-option cards may appear in any order and any location as long as they precede the BEGIN BULK card. There are two general formats for these cards,

\$KEYWORD1 KEYWORD2

or

\$KEYWORD1 N1 N2 N3 ... ,

where the Ni's are positive integers separated by one or more blanks. In order to qualify as a NASTRAN comment card, the \$ must appear in card column #1.

Additional restrictions on the \$-option cards are as follows:

- (1) KEYWORD1 must start in card column #2.
- (2) There may be no imbedded blanks in either keyword.
- (3) Keywords (or integers) must be separated by one or more blanks.
- (4) At least the first two letters of each keyword are required for proper identification.

A complete list of the \$-option cards, along with a summary of the use of each card, appears in Table 2. In the absence of any card listed, the underlined option is chosen by default.

TABLE 2 - SUMMARY OF BANDIT \$-OPTION CARDS

(Underline denotes default; only the first two letters of each keyword are required)

\$SEQUENCE	<u>NO</u>	Resequencing not desired
	<u>YES</u>	Resequencing is desired
\$RIGHTADJUST	<u>NO</u>	No right-adjusting desired
	<u>YES</u>	Bulk data is to be right-adjusted
\$PUNCH	<u>NONE</u>	No punch output desired
	<u>SEQGP</u>	Only SEQGP cards are to be punched
	<u>ALL</u>	The entire NASTRAN deck is to be punched
\$GRID	<u>N1</u>	The integer N1 is an upper bound on the number of grid points. (The default limits the maximum nodal degree to approximately 19.)
\$PRINT	<u>MIN</u>	Basic printed output
	<u>MAX</u>	Extensive printed output
\$MPC	<u>NO</u>	MPC cards are not to be processed
	<u>YES</u>	MPC cards are to be processed
\$IGNORE	<u>N1 N2 N3 ...</u>	Grid numbers Ni appearing here are ignored during resequencing

The \$SEQUENCE card is required to resequence the grid point labels and generate the SEQGP cards. For resequencing purposes, the only other data cards required are BEGIN BULK, ENDDATA, and all connection cards.

The right-adjusting of the bulk data is performed automatically if resequencing (\$SEQUENCE YES) is elected. The user can then elect to have this deck punched by using \$PUNCH ALL. In any case, it can be accessed on TAPE8.

The standard printed output consists of a title page, a listing of the SEQGP cards generated (if resequencing is requested), and a user summary. Use of the \$PRINT MAX card results in the printing of additional tables as well as information on the flow of calculations during the actual resequencing. However, because of the additional work involved in generating several of the tables, the user pays a penalty in the form of increased execution time. A detailed explanation of BANDIT output appears in the next section.

Use of the \$MPC YES card results in the processing of all MPC cards in the NASTRAN deck, regardless of their identifying set numbers. During processing, all dependent grid points on all MPC cards will be eliminated from the connection table after the additional connections due to the constraint relations are accounted for. For this reason, the user would normally decline to use this feature.

Although BANDIT is a variable-core program, the specific way in which the available core is partitioned depends on both the number of grid points and the maximum nodal degree. Nodal degree is defined in Section IV. B. Based on the space available, BANDIT computes default values for the dimensions of various arrays. This partitioning can be

optimized for larger problems by declaring to **BANDIT** the number of grid points present. The appropriate \$-option card is **\$GRID N1**. Here, **N1** is an upper bound (preferably least upper bound) on the number of grid points. In the absence of this card, the default values computed by **BANDIT** result in a limit of approximately 19 on the maximum nodal degree.

The **\$IGNORE** card (Table 2) can be used to designate those grid points **Ni** which should be ignored completely by **BANDIT** during resequencing. This normally results (in NASTRAN) in those points being placed into active columns. Any number of **\$IGNORE** cards may appear, although the total number of ignored points may not exceed 100. Ignored points are renumbered last by the **SEQGP** cards.

IV. PRINTED OUTPUT

A. DESCRIPTION

There are two levels of **BANDIT** printed output: maximum printing (obtained by using the **\$PRINT MAX** card), or minimum printing (obtained by default or by using **\$PRINT MIN**). The latter is a subset of the former.

If resequencing is elected, the basic (minimum) output consists of a listing of the **SEQGP** cards generated and a user summary. The user summary contains the following information:

- (1) original matrix semi-bandwidth
- (2) new matrix semi-bandwidth
- (3) central processor (CP) time in **BANDIT**, in seconds

- (4) original matrix profile
- (5) new matrix profile
- (6) number of grid points
- (7) number of elements
- (8) number of components
- (9) maximum nodal degree
- (10) number of points of zero degree
- (11) punch output requested
- (12) field length (FL), octal
- (13) the FORTRAN variables MAXGRD, MAXDEG, & KORE
(defined below)
- (14) date and time

In the "machine-independent" version of BANDIT (Appendix B), items 3 and 14 and KORE are omitted, since the determination of these quantities involves machine-dependent coding.

B. DEFINITIONS

For a matrix A , we follow the notation of Cuthill⁶ and define θ_i as the difference between i and the column index of the first non-zero element of row i of A . Then the semi-bandwidth B is given by

$$B = \max_i \theta_i \quad (1)$$

This value is listed in 1 and 2 above. We note that the relationship between B and the "NASTRAN bandwidth" B_N is

$$B_N = (B+1)k, \quad (2)$$

⁶ Cuthill, E.C., op. cit.

where k is the average number of degrees-of-freedom per grid point. This formula assumes zero NASTRAN active columns.

The profile P of the matrix A is defined as

$$P = \sum_{i=1}^N \theta_i \quad (3)$$

where N is the matrix order. These values are listed in 4 and 5 of the user summary. They provide some measure of the space which would be required to store the matrix A if profile storage were employed instead of band storage. Since NASTRAN does make use of active columns in its routines, the matrix profile may be of interest to some users.

The number of grid points counted by BANDIT (and listed in the user summary) includes only those points appearing on recognizable elements (Table 1). The NASTRAN GRID cards are not processed.

The number of components of a structure is the number of independent substructures, each of which has no connections with grid points of any other substructure. In the event MPC's are processed, each dependent point is eliminated from the connection table and hence becomes its own component.

The degree of a grid point (node) is defined as the number of other grid points to which it is connected. The user summary lists both the maximum nodal degree and the number of grid points of zero degree.

The variables MAXGRD and MAXDEG are the upper bounds on the number of grid points and maximum nodal degree, respectively, for a given BANDIT run. The variable KORE (given in both octal and decimal) refers to the length of blank common in words. It is included in the summary to aid the user in determining his core requirements for very large structures. (See Section V.)

If the user elects maximum printing, the printed output also includes an internal/external grid point correspondence table, three connection tables, and a set of informational messages concerning the renumbering strategy.

The correspondence table lists, for each internal number, the original grid number to which it corresponds. These internal numbers are simply the integers 1 to N for a structure containing N grid points.

The three connection tables supply connectivity information in terms of internal numbers, original grid point numbers, and renumbered numbers (new numbers assigned by the SEQGP cards). For each node label i, the connection table lists its component index, the "distance" from the first non-zero entry in row i (of the matrix) to the diagonal (θ_i), the degree of node i, and the labels of the adjacent nodes.

V. CORE REQUIREMENTS ON THE CDC COMPUTERS

For a given structure, the core requirements depend on two parameters: the number of grid points NN, and the maximum nodal degree MM.

It is not intended that the user should normally have to calculate the required core in order to use BANDIT. A field length of about 55000₈ words should be sufficient for most structures. However, to cover situations in which either NN or MM is unusually large, the user can estimate his core requirements using the algorithm briefly described here.

The length of blank common storage during any given run is denoted KORE. This space is partitioned among several arrays whose dimensions are given in terms of the variables MAXGRD and MAXDEG, which are upper bounds on NN and MM, respectively. The approximate relationship between these variables is

$$KORE = (\text{MAXGRD}/K+3)*\text{MAXDEG} + 8*\text{MAXGRD}, \quad (4)$$

where K, the number of integers packed per word, is given by

$$K = \begin{cases} 6 & , \text{MAXGRD} < 510 \\ 4 & , \text{MAXGRD} > 2045 \\ 5 & , \text{otherwise.} \end{cases} \quad (5)$$

In the absence of a \$GRID card in the NASTRAN deck, BANDIT assigns default values to MAXGRD and MAXDEG such that MAXDEG is approximately 19. Thus, whenever the user anticipates a maximum nodal degree MM greater than 19, he must make use of the \$GRID card.

Using Equation (4), structures for which $KORE < 8500_{10}$ can be run in a field length (FL) of 55000_8 words. Thus, for larger values of KORE, the user need only increase the FL accordingly.

VI. THE RENUMBERING STRATEGY

Although most of the FORTRAN coding in BANDIT is devoted to the task of developing the connection table, the heart of the program is the strategy used for renumbering. BANDIT uses the bandwidth-reduction

approach developed by E. H. Cuthill and J. M. McKee⁷. The resequencing subroutines were written during their early research in this area. Here, for completeness, we present a brief summary of the main ideas of the strategy. A complete discussion, including comparison with other methods, appears in the Cuthill-McKee paper.⁷ A recent survey article by Cuthill⁸ compares algorithms developed for reducing matrix bandwidth, wavefront, or profile. Extensive bibliographies appear in both these papers and hence need not be cited here.

For the purposes of this discussion, a starting node (or grid point) is one given the new label 1. The Cuthill-McKee method⁷ is direct rather than iterative. It involves first the selection of one or more possible starting nodes. Although these nodes are normally of low degree, the one eventually chosen to be the starting node need not be of minimum degree.

For each possible starting node, the remaining nodes are relabeled according to the following prescription: The nodes adjacent to the starting node are labeled in sequence in the order of their increasing degree. In the terminology of graph theory, these nodes are said to be at the first level. Next, for each node of level 1 and in sequence, the numbering continues with those nodes as yet unnumbered and adjacent, in the order of their increasing degree. The set of all nodes (other than 1) adjacent to level 1 nodes thus constitute level 2. The numbering continues in this fashion, level-by-level, until all nodes have been numbered. If several nodes could receive a given label, the first node to qualify is chosen.

⁷ Cuthill, E. H. and J. M. McKee, op. cit.

⁸ Cuthill, E. H., op. cit.

This procedure is carried out for each possible starting node previously selected. The sequence yielding the lowest bandwidth is finally chosen.

It is apparent that, in the absence of ties for a given label, the relabeling sequence is independent of the original numbering once a starting node has been selected. Thus the original nodal numbering has almost no effect on the final numbering.

A secondary criterion used by BANDIT in the renumbering is the matrix profile P . (The definitions of P and the semi-bandwidth B were given in Section IV.) The BANDIT criterion is that, of those nodal numberings which yield the lowest B , the one resulting in the lowest P is chosen. This often has a beneficial effect because NASTRAN uses active columns in matrix factoring.

Accordingly, all nodes of zero degree are numbered last. A node of zero degree occurs in BANDIT either when selected directly by the user (on \$IGNORE cards) or from MPC equations, in which case the dependent nodes are "eliminated" and thus given zero degree.

A final attempt at reducing the profile still further is made by reversing the previous best numbering; i.e., the nodes labeled 1, 2, ..., n are relabeled $n, n-1, \dots, 1$. As pointed out by George⁹, this frequently results in a lower profile P .

⁹ George, J. A., "Computer Implementation of the Finite Element Method," Ph. D. Thesis, Computer Science Department, Stanford University, 1971.

VII. DESCRIPTION OF THE CODING

The CDC 6400/6600 version of BANDIT consists of a main program, 20 FORTRAN subroutines, six FORTRAN functions, and two routines written in the COMPASS assembly language. The complete program listing is given in Appendix A.

A second version of BANDIT, listed in Appendix B, is essentially the same as the CDC version except that all aspects of the program which are unique to the CDC machines have been deleted. For example, the COMPASS routines, upon which the integer packing and variable-core features depend, and all timing routines have been removed. Thus, this version is slightly less general than the CDC version. On the other hand, the integer packing is less necessary on IBM and Univac machines whose word length is shorter than the 60-bit word length on CDC.

In this brief description of the coding for CDC machines, the differences between the two BANDIT versions are indicated, where appropriate.

The main program, called BANDIT in the CDC version, handles preliminary chores and controls some of the output printing and punching. CORSIZ is called to determine the amount of core available for blank common. GOOGAN is called to learn the user's choice of \$-options and, if necessary, to right-adjust the NASTRAN bulk data deck. The partitioning of blank common is accomplished by a call from GOOGAN to GRID. BANDIT then calls NASNUM, which controls the complete processing of the NASTRAN deck as directed by the \$-options chosen by the user. BANDIT's final duty is to control the listing of the NASTRAN deck, the punching of cards, and the printing of the user summary. BANDIT output was described in Section IV.

Subroutine NASNUM is the executive for the formal processing of the NASTRAN deck and is executed in its entirety only if resequencing is requested. NASNUM first reads the deck and forms the connection table IG. A temporary set of node numbers (denoted Set B) is first assigned in the order in which grid points are encountered. The user's original grid numbers constitute Set A. After all cards have been read, a permanent set of internal numbers (Set C) is assigned such that the user's original grid point numbers are arranged in ascending numerical order. If elected by the user, the connection table IG is then updated by subroutine TIGER to reflect the presence of MPC equations. Here, the new connections caused by MPC's are generated and the list of dependent grid points is saved. Then, with subroutine MORRIS, all dependent nodes and others chosen by the user on \$IGNORE cards are deleted from IG. With the connection table IG now complete, the actual renumbering is performed by SCHEME, which generates a correspondence table between the Set C numbers and a new set of nodal numbers, Set D. The correspondence between the user's original numbers (Set A) and the new nodal numbers (Set D) appears on the SEQGP cards listed.

Subroutine FLIP converts an array of original grid point numbers to the internal numbers used by BANDIT. Only unique non-zero integers are retained in the list.

Subroutine GOOGAN reads a NASTRAN data deck (ID card through ENDDATA card, inclusive) and right-adjusts all bulk data. It optionally converts all cards with 8-column field widths to 16-column widths. It is used here to filter a data deck so as to retain only those cards associated with the structure geometry. Finally, it reads the user's \$-option cards and sets the appropriate parameters.

Subroutine **GRID** sets up the dimensions of all those arrays whose lengths depend on either the number of grid points or the maximum nodal degree. The upper bounds on these two quantities are stored in **MAXGRD** and **MAXDEG**, respectively. Since the entries in the connection table **IG** are packed with either four, five, or six integers per word, the packing density is also determined here.

Subroutine **READIT** is called by **GOOGAN** whenever a \$ card containing integer data is encountered. This routine interprets and stores in **IP** all positive integers on the data card. The variable **NIP** contains the number of integers stored in **IP**. **A(I)** contains the alphabetic representation of the character in card column **I**.

Subroutine **BOMBIT** is called whenever a fatal error is detected. This routine writes an appropriate error message onto both the output file, if necessary, and the CDC dayfile. The job is then aborted in order to suppress the execution of **NASTRAN** following that of **BANDIT**.

Subroutine **SCAT** is called once for each grid point appearing on a connection card. The routine supplies a fast way of determining for a grid point whether that point has been encountered before and, if so, which temporary internal number has been assigned to it. This is accomplished with the array **INV(I, J)**, where **INV(I, 1)** contains an original grid number and **INV(I, 2)** contains the internal number assigned to it. The location **I** chosen for grid point **N** is given by

$$I = \text{MOD}(N-1, KMOD) + 1 . \quad (6)$$

If that location has previously been selected for some other point, the first available location following **I** is used instead. The row dimension of **INV** is approximately **2*MAXGRD**, where **MAXGRD** is the upper bound on the number of grid points.

Subroutine BRIGIT is called after all connection cards have been read and the connection table is complete. Prior to the call, the internal numbers were assigned to the original grid numbers in order of their occurrence. BRIGIT performs a sort of the original numbers, assigns new sequential internal numbers, and converts the connection table IG and the array NORIG to the new set of internal numbers. Here, NORIG(I) contains the original grid point number corresponding to the internal number I.

Subroutine SORT sorts a list of length NL. The routine operates fastest on those lists not badly out of order.

Subroutine SETIG makes additions to the connection table IG. For example, if KG1 and KG2 are two connected grid points, this routine sets IG(KG1, J) = KG2 and IG(KG2, K) = KG1, for some J and K, if this connection has not already been set.

Subroutine TIGER makes additions to the connection table IG required by the presence of MPC's. The dependent grid points (those appearing first in each equation) are stored in array LIST for later removal from IG. This routine is called by NASNUM and executed only if the user elects to take the MPC's into account by inserting the card \$MPC YES into the NASTRAN deck.

Subroutine SWITCH generates a new connection table IG according to a correspondence table KT which is set up prior to the call. Here KT(I) contains the new designation to be assigned to the grid number currently labeled I, i.e., KT(old) = new.

Subroutine MORRIS deletes all reference in the connection table IG to those points stored in an array LIST of length NL.

Subroutine FIXIT compresses out zeroes and multiple entries in an array LIST originally of length NL. A corrected length NL is returned

to the calling program.

Subroutine SCHEME is the executive for the actual renumbering strategy. The principal quantities required before the call are the number of nodes NN, an upper bound MM on the maximum nodal degree, and the connection table IG. IG is an NN x MM matrix such that a typical element $IG(I,J)$ contains the label of the Jth node adjacent to node I. The node labels referred to here are the permanent (sorted) set of internal numbers assigned by BANDIT.

SCHEME first determines the degree of each node, the most prevalent nodal degree, the number of components, the maximum nodal degree, and the original bandwidth. Then, for each component, a list of starting nodes is supplied by DIAM followed by a resequencing by RELABL for each starting node. The numbering sequence yielding the lowest bandwidth and profile is eventually chosen as the new numbering sequence. The output from SCHEME includes an array ILD, where $ILD(I)$ contains the new label corresponding to the original internal label I.

Subroutine STACK is called by SCHEME after the basic renumbering has been completed. This routine determines all points of zero degree and places them last in the numbering sequence.

Subroutine REVERS reverses the numbering of the first NN-KT grid points, where NN is the total number of grid points and KT is the number of points of zero degree. The variable KT is set in subroutine STACK prior to any calls to REVERS.

Subroutine DEGREE sets up the IDEG array containing in location I the degree of node I.

Function MODE has as its value the most prevalent nodal degree. If several degrees are equally prevalent, the lowest is chosen.

Function COMPNT has as its value the number of components stored in the array IG. This function also sets up arrays IC, in which the I^{th} element contains a component index for the node labeled I, and ICC, in which the I^{th} element contains an index indicating the starting position to be used for labels for component I. Thus, the number of elements in component I is given by

$$\text{ICC}(I+1) - \text{ICC}(I).$$

Function MAXDGR has as its value the maximum degree of any node of component NC > 0 . If the formal parameter NC ≤ 0 , all components are considered.

Function MAXBND has as its value the maximum difference between node labels of connected nodes for nodes of component NC > 0 . If the parameter NC ≤ 0 , all components are considered and hence the bandwidth is computed. This routine also computes IH, the matrix profile.

Function MINDEG has as its value the minimum degree of any node of component NC > 0 . If NC ≤ 0 , all components are considered.

Subroutine DIAM determines NL starting nodes and stores the list in the array NODESL.

Subroutine RELABL generates a relabeling scheme starting with NS nodes whose labels are stored in the array NODES. Although this routine allows for multiple starting nodes, BANDIT currently considers only one starting node at a time (corresponding to NS = 1). The relabeling permutation developed by RELABL is stored in ILD and NEW. ILD(I) contains the new label for the node labeled I in the original numbering scheme. The NEW array is the inverse of ILD.

Function IDIST has as its value the maximum distance of any node in component IC(NS) from the node NS. The distance of each node in

this component is stored in the array IDIS. The maximum number of nodes at the same distance from NS is stored in ML.

The COMPASS routine PCUP has three entry points used by BANDIT: PACK, IUNPK, and ABT. The first two are for integer packing and unpacking, respectively. Since most of the BANDIT variables are integer, the CDC 60-bit word length is wasteful of available core. Thus, to reduce the overall core requirements, the connection table IG is packed with four, five, or six integers per word. For example, instead of the FORTRAN statement

$$IG(I, J) = L , \quad (7)$$

we have

$$CALL PACK(IG, MAXGRD*(J-1)+I, NBITIN, L). \quad (8)$$

Similarly, instead of

$$M = IG(I, J) , \quad (9)$$

we have

$$M = IUNPK(IG, MAXGRD*(J-1)+I, NBITIN). \quad (10)$$

Here, the first three arguments refer to the function name, the location, and the number of bits per integer, respectively, and MAXGRD is the row-dimension of IG. Statements of these types appear throughout the coding of the CDC version of BANDIT.

Subroutine ABT causes an abnormal termination of BANDIT.

The other COMPASS routine, CORSIZ, provides BANDIT with its variable-core feature by interrogating the system during execution to determine the field length (FL) and the distance from the first word of blank common to the end of the FL. These values are returned to the calling program through common block /K/ .

The **BANDIT** listing in Appendix B was prepared for machines other than **CDC** machines and omits the routines written in the **COMPASS** assembly language. Hence this version of **BANDIT** has no integer packing and is a fixed-core program. Additional changes were made in **BANDIT**, **NASNUM**, **GRID**, and **BOMBIT** and given new end-punching (JJ).

The following disk files are used by this version of **BANDIT**: **TAPE5** (input), **TAPE6** (output), **TAPE7** (punch), **TAPE9** (scratch), **TAPE11** (scratch), and **TAPE8**. The latter is a BCD file which, after a successful **BANDIT** run, contains the complete **NASTRAN** data deck.

The Appendix B version of **BANDIT** could easily be converted into a variable-core program for any machine for which an assembly language routine could be written to determine the length of blank common storage.

ACKNOWLEDGMENTS

The author wishes to thank Dr. E. H. Cuthill and James M. McKee for ideas resulting from many interesting and stimulating discussions and for the following research subroutines which have been incorporated into **BANDIT**: **SCHEME**, **DEGREE**, **COMPNT**, **MAXDGR**, **MAXBND**, **MINDEG**, **DIAM**, **RELABL**, and **IDIST**. Appreciation is also expressed to Michael E. Golden for the assembly language routines which he developed.

APPENDIX A
LISTING OF THE CDC VERSION OF BANDIT

```

PROGRAM BANDIT(INPUT=601,OUTPUT=601,PUNCH=161,INSERT=161,
1 TAPE5=INPUT,TAPE6=OUTPUT,TAPE7=PUNCH,TAPE12=INSERT,
2 TAPE8=801,TAPE9=801,TAPE11=161)
C
C          B A N D I T
C
C MAIN PROGRAM FOR THE RENUMBERING OF NASTRAN GRID POINTS FOR
C REDUCED BANDWIDTH.
C THE NASTRAN DATA DECK MUST CONTAIN A BEGIN BULK CARD IN ITS
C PROPER PLACE AND TERMINATE WITH AN ENDDATA CARD.
      DIMENSION A(20)
      COMMON KOM(1000)
      COMMON /S/ NN,MM,IH,IB
      COMMON /P/ IH0,IHE
      COMMON /A/ MAXGRD,MAXDEG,KMOD,NMPC
      COMMON /B/ IPARAM(120),IARG(5)
      COMMON /C/ IWARN,LINE,KORIG,KNEW
      COMMON /K/ II(7),KORE,IFL
      COMMON /BITS/ NBITIN,NBITEX,IPASS
      COMMON /TIME/ STIME,NCOMP
      COMMON /NEL/ NEL,TIM2
      COMMON /DOL/ ISTART(100),IGNORE(100),IFIRST(100)
      COMMON /DOL/ IDIM,ISTA,IIIG,IFIR,IGDEG,ISCH
      COMMON /ZERO/ KT
      COMMON /NG/ NGRID,CLOCK
      INTEGER EOF
      DATA BEGI,ENDDO,SEQG/4HBEGI,4HENOD,4HSEQG/
      CALL SECOND(TIM1)
      CALL REMARK(40H== N A S T R A N -- B A N D I T ==)
      CALL DATE(DAY)
      CALL TIME(CLOCK)
C DETERMINE KORE, THE DIMENSION OF THE KOM ARRAY, AND IFL, THE FL.
      CALL CORSIZ
C SET NGRID DEFAULT.
      NGRID=KORE/12
      IF(NGRID.GT.2045) NGRID=KORE/13
C SET SCHEME DEFAULTS.
      IARG(1)=80
      IARG(2)=1
      IARG(3)=2
      IARG(4)=2
      IARG(5)=0
C SET NUMBER OF BITS PER WORD FOR INTERNAL AND EXTERNAL
C GRID NUMBERS.
      NBITIN=12
      NBITEX=60
      7 FORMAT(1H1,16(/),
      1 36X,57HBBBBB,      AAAAAA   N   N   000000   IIIIII   TTTTTT/BANDIT49
      2 36X,57H B   A   A   NN   N   0   0   I   T   /BANDIT50
      3 36X,57H B   A   A   N   N   N   0   0   I   T   /BANDIT51
      4 36X,57HBBBBBBB,      A   A   N   N   N   0   0   I   T   /BANDIT52
      5 36X,57H B   AAAAAAA   N   N   N   0   0   I   T   /BANDIT53
      6 36X,57H B   A   A   N   NN   0   0   I   T   /BANDIT54
      7 36X,57HBBBBBB,      A   A   N   N   000000   IIIIII   T   )BANDIT55
      8 FORMAT(2(1H,48X,34HTHEORY OF STRUCTURES BRANCH (1844) /
      1   46X,38HCOMPUTATION AND MATHEMATICS DEPARTMENT /
      2   44X,42HNAVAL SHIP RESEARCH AND DEVELOPMENT CENTER /
      3   53X,24HBTHESDA, MARYLAND 20034 )
      9 FORMAT(//61X,8HCDC 6700/57X,
      + 16HREV. 10 MAR 1972 )
      10 FORMAT(20A4)
      11 FORMAT(1H ,20A4)
      12 FORMAT(1H1)
      13 FORMAT(//26H TOTAL CP TIME IN BANDIT = ,F9.3,6H SEC.)
      LINE=55
      KNEW=0
      REWIND 8
C PRINT TITLE PAGE.
      WRITE(6,7)
      WRITE(6,8)
      WRITE(6,9)
C INITIALIZE VARIABLES.
      DO 15 J=1,20
      15 IPARAM(J)=0
      IPARAM(12)=4
      IDIM=100
      ISTA=0
      IIIG=0
      ISCH=0
      IFIR=0
      IGDEG=0
      DO 18 I=1,100
      ISTART(I)=0
      IFIRST(I)=0
      18 IGNORE(I)=0
      IPASS=0
      NN=0
      MM=0
      MAXGRD=0
      MAXDEG=0
      KMOD=0
      KORIG=0
      KNEW=0
      STIME=0.
      NCOMP=0
      NEL=0
      KT=0
      TIM2=0.
      REWIND 9
C READ DECK FOR FIRST TIME.
      BANDIT 2           1
      BANDIT 3           2
      BANDIT 4           3
      BANDIT 5           4
      BANDIT 6           5
      BANDIT 7           6
      BANDIT 8           7
      BANDIT 9           8
      BANDIT10          9
      BANDIT11          10
      BANDIT12          11
      BANDIT13          12
      BANDIT14          13
      BANDIT15          14
      BANDIT16          15
      BANDIT17          16
      BANDIT18          17
      BANDIT19          18
      BANDIT20          19
      BANDIT21          20
      BANDIT22          21
      BANDIT23          22
      BANDIT24          23
      BANDIT25          24
      BANDIT26          25
      BANDIT27          26
      BANDIT28          27
      BANDIT29          28
      BANDIT30          29
      BANDIT31          30
      BANDIT32          31
      BANDIT33          32
      BANDIT34          33
      BANDIT35          34
      BANDIT36          35
      BANDIT37          36
      BANDIT38          37
      BANDIT39          38
      BANDIT40          39
      BANDIT41          40
      BANDIT42          41
      BANDIT43          42
      BANDIT44          43
      BANDIT45          44
      BANDIT46          45
      BANDIT47          46
      BANDIT48          47
      BANDIT49          48
      BANDIT50          49
      BANDIT51          50
      BANDIT52          51
      BANDIT53          52
      BANDIT54          53
      BANDIT55          54
      BANDIT56          55
      BANDIT57          56
      BANDIT58          57
      BANDIT59          58
      BANDIT60          59
      BANDIT61          60
      BANDIT62          61
      BANDIT63          62
      BANDIT64          63
      BANDIT65          64
      BANDIT66          65
      BANDIT67          66
      BANDIT68          67
      BANDIT69          68
      BANDIT70          69
      BANDIT71          70
      BANDIT72          71
      BANDIT73          72
      BANDIT74          73
      BANDIT75          74
      BANDIT76          75
      BANDIT77          76
      BANDIT78          77
      BANDIT79          78
      BANDIT80          79
      BANDIT81          80
      BANDIT82          81
      BANDIT83          82
      BANDIT84          83
      BANDIT85          84
      BANDIT86          85
      BANDIT87          86
      BANDIT88          87
      BANDIT89          88
      BANDIT90          89
      BANDIT91          90
      BANDIT92          91
      BANDIT93          92
      BANDIT94          93
      BANDIT95          94
      BANDIT96          95
      BANDIT97          96
      BANDIT98          97
      BANDIT99          98
      BANDIT100         99
      BANDIT101        100

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```

CALL GOOGAN(1,2,5,9)
C SLICE UP CORE ACCORDING TO SUBROUTINE GRID.
K2=II(1)*II(2)+1
K3=K2+II(3)*2
K4=K3+II(4)
K5=K4+II(5)
K6=K5+II(6)
K7=K6+II(7)
C PROCESS DECK.
CALL NASNUM(KOM(1),II(1),KOM(K2),II(3),KOM(K3),KOM(K4),KOM(K5),
+ KOM(K6),KOM(K7),KOM(1),KOM(K2))
C ARRAY STARTING AT LOCATION K7 HAS DIMENSION 2*MAXDEG
C PROCESS OUTPUT ACCORDING TO OUTPUT REQUESTS.
C CHECK IF CONNECTION CARDS IN DECK.
IF(IPARAM(9).EQ.3)GO TO 19
REWIND 8
REWIND 9
FLAG=ENDO
J=0
K=9
GO TO 20
19 REWIND 8
J=0
K=8
FLAG=ENDO
IF(IPARAM(5).EQ.4)GO TO 20
K=9
IF(IPARAM(6).EQ.3)FLAG=BEGI
20 READ(K,10)A
IF(EOF(K).NE.0)CALL BOMBIT(1)
J=J+1
IF(IPARAM(10).EQ.5.AND.A(1).NE.SEQG) J=J-1
IF(MOD(J,LINE).EQ.1)WRITE(6,12)
IF(IPARAM(10).EQ.6) WRITE(6,11) A
IF(IPARAM(10).EQ.5.AND.A(1).EQ.SEQG) WRITE(6,11) A
IF(IPARAM(1).EQ.2)WRITE(7,10) A
IF(IPARAM(1).EQ.1.AND.A(1).EQ.SEQG) WRITE(7,10) A
IF(K.NE.8) WRITE(8,10) A
IF(A(1).NE.0) WRITE(8,10) A
IF(FLAG.EQ.ENDO)GO TO 25
FLAG=ENDO
K=5
GO TO 20
25 CALL SECOND(TIM2)
TIM2=TIM2-TIM1
IF(IPARAM(5).EQ.3)GO TO 60
IF(IPARAM(7).EQ.4)GO TO 60
IF(IPARAM(9).EQ.4)GO TO 60
C USER SUMMARY.
WRITE(6,50) KORIG,KNEW,TIM2
50 FORMAT(23H1***BANDIT USER SUMMARY /
1 8X,25HORIGINAL SEMI-BANDWIDTH = ,I9/
2 8X,20HNEW SEMI-BANDWIDTH = ,I14/
3 8X,19HCP TIME IN BANDIT = ,F9.3,6H SEC. )
WRITE(6,117) IH0,IHE
117 FORMAT(8X,18HORIGINAL PROFILE =,I16/8X,13HNEW PROFILE =,I21)
WRITE(6,104) NN
WRITE(6,113) NEL
WRITE(6,112) NCMP
WRITE(6,107) MM
107 FORMAT(8X,22HMAXIMUM NODAL DEGREE = ,I12)
WRITE(6,116) KT
I=IPARAM(1)
IF(I.EQ.1) WRITE(6,101)
IF(I.EQ.2) WRITE(6,102)
IF(I.EQ.3) WRITE(6,103)
101 FORMAT(8X,34HPUNCH OUTPUT      SEQGP CARDS )
102 FORMAT(8X,34HPUNCH OUTPUT      ALL CARDS )
103 FORMAT(8X,34HPUNCH OUTPUT      NONE )
WRITE(6,119) IFL
WRITE(6,105) MAXGRD,MAXDEG
105 FORMAT(18X,8HMAXGRD =,I11/18X,8HMAXDEG = ,I11)
WRITE(6,109) KORE,KORE
109 FORMAT(18X,6HKORE =,Ii3/18X,6HKORE =,6X,06,1HB)
WRITE(6,111) DAY,CLOCK
111 FORMAT(8X,14HDATE AND TIME ,2A10)
C IPASS=NUMBER OF PCUR CALLS.
104 FORMAT(8X,23HNUMBER OF GRID POINTS = ,I11)
113 FORMAT(8X,20HNUMBER OF ELEMENTS = ,I14)
112 FORMAT(8X,22HNUMBER OF COMPONENTS = ,I12)
116 FORMAT(8X,28# OF POINTS OF ZERO DEGREE = ,I6)
119 FORMAT(8X,19HFIELD LENGTH (FL) = ,8X,06,1HB)
GO TO 70
60 IF(IPARAM(10).EQ.5) WRITE(6,12)
WRITE(6,13) TIM2
70 CONTINUE
REWIND 8
IF(IPARAM(8).EQ.4) STOP 5
STOP
END
SUBROUTINE NASNUM(IG,III,INV,II3,INT,ICC,ILD,NORIG,IP,JG,JNV)
DIMENSION A(8),KG(40),LG(40),LINE(10),B(20),ATEMP(4)
DIMENSION IG(III,1),INV(II3,2),JG(1),JNV(1)
DIMENSION INT(1),ICC(1),ILD(1),NORIG(1),IP(1)
C IP HAS DIMENSION 2*MAXDEG. JG AND JNV ARE EQUIV TO IG AND INV.
COMMON /S/ NN,MM,IH,IB
COMMON /A/ MAXGRD,MAXDEG,KMOD,NMPC
COMMON /B/ IPARAM(20),IARG(5)
COMMON /C/ IWARN,NLINE,KORIG,KNEW
COMMON /BITS/ NBITIN,NBITEX,IPASS

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COMMON /K/ II(7),KORE	NASNUM12	201
COMMON /TIME/ TIM2,NCOMP	NASNUM13	202
COMMON /NEL/ NEL	NASNUM14	203
COMMON /DOLY/ ISTART(100),IGNORF(100),IFIRST(100)	NASNUM15	204
COMMON /DOLY/ IOIM,ISTA,IIG,IFIR,IGOE,ISCH	NASNUM16	205
C THE VARIABLE LINE DEFINED NEAR CARD NASNUM.300 IS NOT THE	NASNUM17	206
C SAME AS THE VARIABLE LINE APPEARING IN COMMON	NASNUM18	207
C IN OTHER ROUTINES.	NASNUM19	208
DIMENSION TYPE(50),WYPE(50)	NASNUM20	209
DIMENSION F1A(2),F10A(2),F1B(2),F10B(2)	NASNUM21	210
DATA BEGI,FEND,SEQG/4HREGI,4HENDD,4HSEQG/	NASNUM22	211
DATA TYPE/4HCQBLA,4HCELA,4HCNRLA,4HCQDM,4HCQDP,4HCQUA,	NASNUM23	212
1 4HCQBLA,4HCQUA,4HCR00,4HCSH,4HCTR8,4HCTRI,4HCTR8,4HCTR8,	NASNUM24	213
2 4HCTR8,4HCTU8,4HCTW1,4HENDD,4HMPC*,4HCDAM,4HCDAM,4HCMAS,	NASNUM25	214
3 4HCMAS,4HCVIS,4HCOAM,4HCOAM,4HCELA,4HCELA,4HCMAS,4HCMAS,	NASNUM26	215
4 4HCCON,4HCTR0,4HCTR8,4HCTRI,4HCONN,4HCHT8,4HCIS3,	NASNUM27	216
5 4HCIS3,4HCIS2,4HCIS2,4HCISH,4HCISH,4HCFLU,4HCFLU,4HCFLU,	NASNUM28	217
6 4HCTET,4HCHEX,4HCHEX/	NASNUM29	218
DATA WYPE/4H*,4HS1*,4HS2*,4HD0*,4HEM*,4HLT*,4HD1*,	NASNUM30	219
1 4HD2*,4HD3*,4H*,4HAR*,4HSC*,4HA1*,4HA2*,4HEM*,	NASNUM31	220
2 4HLT*,4HE*,4HST*,4HATA,4H,4HP1*,4HP2*,4HS1*,	NASNUM32	221
3 4HS2*,4HCO,4HP3*,4HP4*,4HS3*,4HS4*,4HS5*,4HS4*,	NASNUM33	222
4 4HEAX*,4HRCG*,4HRCG*,4HARG*,4H1*,4H2*,4HRI2*,4HD8*,	NASNUM34	223
5 4HD02*,4HD04*,4HD8*,4HB*,4H16*,4HID2*,4HID3*,4HID4*,	NASNUM35	224
6 4HRA*,4HA1*,4HA2*/	NASNUM36	225
NTYPE=50	NASNUM37	226
REWIND 8	NASNUM38	227
REWIND 9	NASNUM39	228
NMPC=40	NASNUM40	229
KMOD=2.*FLOAT(MAXGRD)-2.2715*SQRT(1.131*FLOAT(MAXGRD))	NASNUM41	230
NFW=0	NASNUM42	231
IWARN=0	NASNUM43	232
NEO=0	NASNUM44	233
2 FORMAT(29H1BANDIT INFORMATION MESSAGE -	NASNUM45	234
+19H NO GRID POINTS/	NASNUM46	235
+28H RESEQUENCING SUPPRESSED)	NASNUM47	236
4 FORMAT(19H **NEW BANDWIDTH =,I6)	NASNUM48	237
5 FORMAT(33H1THE WRONG CARD FOLLOWS THIS CARD/1X,2A4,1P4E16.7,2A4//	NASNUM49	238
2 40H THE CONTINUATION CARD IS REQUIRED NEXT ,	NASNUM50	239
3 36HSINCE BANDIT DOES NOT SORT THE DECK.	NASNUM51	240
4 13H FATAL ERROR.)	NASNUM52	241
6 FORMAT(1H1)	NASNUM53	242
7 FORMAT(54H1 ONE OR MORE SEQGP CARDS ALREADY APPEAR IN DATA DECK./	NASNUM54	243
* 55H RESEQUENCING CANNOT BE REQUESTED. FATAL ERROR.)	NASNUM55	244
8 FORMAT(5HSEQGP,3X,2I8,56X)	NASNUM56	245
9 FORMAT(20A4)	NASNUM57	246
10 FORMAT(2A4,4F16.0,2A4)	NASNUM58	247
11 FORMAT(1H ,5(I8,1I1,7X))	NASNUM59	248
12 FORMAT(5HFQGP,3X,8I8,8X)	NASNUM60	249
14 FORMAT(//26H **BANDIT WARNING MESSAGE /	NASNUM61	250
1 11X,35HTHE WRONG CARD MAY FOLLOW THIS CARD /	NASNUM62	251
2 11X,2A4,1P4E16.7,2A4/	NASNUM63	252
3 11X,47HCHECK INPUT DECK TO BE SURE THAT A CONTINUATION ,	NASNUM64	253
4 42H CARD IS NEITHER MISSING NOR OUT OF SORT.)	NASNUM65	254
15 FORMAT(26H TOTAL CP TIME IN SCHEME =,F9.3,6H SEC.)	NASNUM66	255
19 FORMAT(1H1,5(20HINTERNAL ORIGINAL,6X)/	NASNUM67	256
11H ,5(20HGRID NO. GRID PT.,6X))	NASNUM68	257
C RETURN IF RESEQUENCING IS NOT DESIRED.	NASNUM69	258
IF(IPARAM(5).EQ.3)RETURN	NASNUM70	259
C CHECK IF SEQGP CARDS ALREADY APPEAR IN DECK.	NASNUM71	260
IF(IPARAM(7).EQ.3)GO TO 22	NASNUM72	261
C ABORT BANDIT SINCE SEQGP CARDS ALREADY APPEAR IN DECK.	NASNUM73	262
WRITE(6,7)	NASNUM74	263
CALL BOMBIT(3)	NASNUM75	264
C READ AND EXTRACT CONNECTION CARDS FROM DECK.	NASNUM76	265
22 CALL GOOGAN(2,1,9,8)	NASNUM77	266
REWIND 8	NASNUM78	267
REWIND 9	NASNUM79	268
C INITIALIZE EXPANDABLE CORE.	NASNUM80	269
DO 30 I=1,KORE	NASNUM81	270
30 JG(I)=0	NASNUM82	271
C READ CARD.	NASNUM83	272
40 READ(8,10)F1A,(A(I),I=1,4),F10A	NASNUM84	273
C DETERMINE CARD TYPE.	NASNUM85	274
45 ITYPE=0	NASNUM86	275
DO 50 I=1,NTYPE	NASNUM87	276
50 IF(F1A(1).EQ.TYPE(I).AND.F1A(2).EQ.WYPE(I)) ITYPE=I	NASNUM88	277
IF(ITYPE.EQ.0)GO TO 40	NASNUM89	278
IF(ITYPE.EQ.19)GO TO 500	NASNUM90	279
IF(ITYPE.EQ.20.AND.IPARAM(4).EQ.3)GO TO 40	NASNUM91	280
C READ CONTINUATION TO CARD JUST READ.	NASNUM92	281
READ(8,10)F1B,(A(I),I=5,8),F10B	NASNUM93	282
C CHECK EACH LOGICAL CARD FOR PROPER SORT.	NASNUM94	283
IF(F1B(1).EQ.F10A(1).AND.F1B(2).EQ.F10A(2)) GO TO 60	NASNUM95	284
C--- IF FOLLOWING CARD TYPES ARE OUT OF SORT, NO ERROR	NASNUM96	285
IF(ITYPE.EQ.1.OR.ITYPE.EQ.4)GO TO 56	NASNUM97	286
IF(ITYPE.EQ.32)GO TO 56	NASNUM98	287
IF(ITYPE.EQ.33)GO TO 56	NASNUM99	288
IF(ITYPE.EQ.35)GO TO 56	NASNU100	289
IF(ITYPE.EQ.36)GO TO 56	NASNU101	290
IF(ITYPE.EQ.37)GO TO 56	NASNU102	291
IF(ITYPE.EQ.45.OR.ITYPE.EQ.46) GO TO 56	NASNU103	292
C--- IF FOLLOWING CARD TYPES ARE OUT OF SORT, POSSIBLE ERROR (GIVE	NASNU104	293
WARNING MESSAGE)	NASNU105	294
IWARN=IWARN+1	NASNU106	295
IF(MOD(IWARN,6).EQ.1)WRITE(6,6)	NASNU107	296
IF(ITYPE.EQ. 2) GO TO 54	NASNU108	297
IF(ITYPE.EQ. 3) GO TO 54	NASNU109	298
IF(ITYPE.EQ.10) GO TO 54	NASNU110	299
IF(ITYPE.EQ.17) GO TO 54	NASNU111	300

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      IF(ITYPE.GE.21.AND.ITYPE.LE.31)GO TO 54          NASNU112   301
C--- FOR OTHER CARD TYPES OUT OF SORT, ABORT BANDIT    NASNU113   302
      52 WRITE(6,51F1A,(A(I),I=1,4),F10A           NASNU114   303
         CALL 3OMB1T(2)                                NASNU115   304
         54 WRITE(6,14)F1A,(A(I),I=1,4),F10A          NASNU116   305
C SAVF CONTENTS OF THE SECOND CARD OF THE PAIR.       NASNU117   306
      55 DO 58 I=1,4                                  NASNU118   307
         ATEMP(I)=A(I+4)                            NASNU119   308
      58 A(I+4)=0.                                     NASNU120   309
C INITIALIZE KG AND LG.   **                      NASNU121   310
      59 DO 70 I=1,NMPC                           NASNU122   311
         KG(I)=0.                                 NASNU123   312
      70 LG(I)=0.                                LOOP=1     NASNU124   313
         NCON=4.                                NASNU125   314
C SET UP KG AND LG.   **                      NASNU126   315
      GO TO (160,220,220,200,120,120,120,120,180,120,140,140,
1        140,140,140,180,120,500,230,220,220,220,180,180,      NASNU127   316
2        140,180,180,180,180,160,160,110,114,118,118,140,80,      NASNU128   317
3        95,120,90,80,95,200,114,110,120,90,90,ITYPE             NASNU129   318
C* CIS3D8,CISH8          NASNU130   319
      80 DO 81 I=1,7                                NASNU131   320
      81 KG(I)=A(I+1)+0.5                          NASNU132   321
         NCON=8.                                READ(8,10) F1A,A(1),A(2),A(3),A(4),F10A
         IF(F1A(1).NE.F10B(1).OR.F1A(2).NE.F10B(2)) GO TO 100
         KG(8)=A(1)+0.5
         GO TO 250
C* CIS3D0          NASNU133   322
      85 DO 86 I=1,7                                NASNU134   323
      86 KG(I)=A(I+1)+0.5                          NASNU135   324
         NCON=8.                                READ(8,10) F1A,A(1),A(2),A(3),A(4),F10A
         IF(F1A(1).NE.F10B(1).OR.F1A(2).NE.F10B(2)) GO TO 100
         READ(8,10) F1B,A(5),A(6),A(7),A(8),F10B
         IF(F1B(1).NE.F10A(1).OR.F1B(2).NE.F10A(2)) GO TO 52
         DO 87 I=9,15
         87 KG(I)=A(I-7)+0.5
         READ(8,10) F1A,A(1),A(2),A(3),A(4),F10A
         IF(F1A(1).NE.F10B(1).OR.F1A(2).NE.F10B(2)) GO TO 100
         READ(8,10) F1B,A(5),A(6),A(7),A(8),F10B
         IF(F1B(1).NE.F10A(1).OR.F1B(2).NE.F10A(2)) GO TO 52
         DO 88 I=16,20
         88 KG(I)=A(I-15)+0.5
         GO TO 250
C* CIS2D8,CHEXA1,CHEXA2          NASNU140   329
      90 DO 91 I=1,6                                NASNU141   330
      91 KG(I)=A(I+2)+0.5                          NASNU142   331
         NCON=9.                                READ(8,10) F1A,A(1),A(2),A(3),A(4),F10A
         IF(F1A(1).NE.F10B(1).OR.F1A(2).NE.F10B(2)) GO TO 100
         READ(8,10) F1B,A(5),A(6),A(7),A(8),F10B
         IF(F1B(1).NE.F10A(1).OR.F1B(2).NE.F10A(2)) GO TO 52
         DO 92 I=7,8
         92 KG(I)=A(I-6)+0.5
         GO TO 250
C* CIS1H6          NASNU143   332
      95 DO 96 I=1,7                                NASNU144   333
      96 KG(I)=A(I+1)+0.5                          NASNU145   334
         NCON=16.                               READ(8,10) F1A,A(1),A(2),A(3),A(4),F10A
         IF(F1A(1).NE.F10B(1).OR.F1A(2).NE.F10B(2)) GO TO 100
         READ(8,10) F1B,A(5),A(6),A(7),A(8),F10B
         IF(F1B(1).NE.F10A(1).OR.F1B(2).NE.F10A(2)) GO TO 52
         DO 97 I=8,15
         97 KG(I)=A(I-7)+0.5
         READ(8,10) F1A,A(1),A(2),A(3),A(4),F10A
         IF(F1A(1).NE.F10B(1).OR.F1A(2).NE.F10B(2)) GO TO 100
         KG(16)=A(1)+0.5
         GO TO 250
      100 F1A(1)=F1B(1)
         F1A(2)=F1B(2)
         DO 101 I=1,4
      101 A(I)=A(I+4)
         F10A(1)=F10B(1)
         F10A(2)=F10B(2)
         GO TO 52
C* CTRAPRG,CFLUID4          NASNU146   335
      110 DO 112 I=1,4                                NASNU147   336
      112 KG(I)=A(I+1)+0.5                          NASNU148   337
         GO TO 250
C* CTRIARG,CFLUID3          NASNU149   338
      114 DO 116 I=1,3                                NASNU150   339
      116 KG(I)=A(I+1)+0.5                          NASNU151   340
         GO TO 250
C* CONM1, CONM2          NASNU152   341
      118 KG(1)=A(2)+0.5                            NASNU153   342
         KG(2)=KG(1)
         GO TO 250
C* CQDMEM,CQDPLT,CQUAD1,CQUAD2,CQUAD3,CSHEAR,CTHIST,CIS2D4,CTETRA
      120 DO 130 I=1,4                                NASNU154   343
      130 KG(I)=A(I+2)+0.5                          NASNU155   344
         GO TO 250
C* CTRBSC, CTRIA1, CTRIA2, CTRMEM, CTRPLT, CHTTRI2          NASNU156   345
      140 DO 150 I=1,3                                NASNU157   346
      150 KG(I)=A(I+2)+0.5                          NASNU158   347
         GO TO 250
C* CBAR, CCONEAX, CTORDRG          NASNU159   348
      160 DO 170 I=1,2                                NASNU160   349
      170 KG(I)=A(I+2)+0.5                          NASNU161   350
         GO TO 250
C* CROD, CTUBE, CVISC, CDAMP3, CDAMP4, CELAS3, CELAS4, CHASS3, CHASS4
      170 KG(I)=A(I+2)+0.5                          NASNU162   351
         GO TO 250
      170 KG(I)=A(I+2)+0.5                          NASNU163   352
         GO TO 250
      170 KG(I)=A(I+2)+0.5                          NASNU164   353
         GO TO 250
      170 KG(I)=A(I+2)+0.5                          NASNU165   354
         GO TO 250
      170 KG(I)=A(I+2)+0.5                          NASNU166   355
         GO TO 250
      170 KG(I)=A(I+2)+0.5                          NASNU167   356
         GO TO 250
      170 KG(I)=A(I+2)+0.5                          NASNU168   357
         GO TO 250
      170 KG(I)=A(I+2)+0.5                          NASNU169   358
         GO TO 250
      170 KG(I)=A(I+2)+0.5                          NASNU170   359
         GO TO 250
      170 KG(I)=A(I+2)+0.5                          NASNU171   360
         GO TO 250
      170 KG(I)=A(I+2)+0.5                          NASNU172   361
         GO TO 250
      170 KG(I)=A(I+2)+0.5                          NASNU173   362
         GO TO 250
      170 KG(I)=A(I+2)+0.5                          NASNU174   363
         GO TO 250
      170 KG(I)=A(I+2)+0.5                          NASNU175   364
         GO TO 250
      170 KG(I)=A(I+2)+0.5                          NASNU176   365
         GO TO 250
      170 KG(I)=A(I+2)+0.5                          NASNU177   366
         GO TO 250
      170 KG(I)=A(I+2)+0.5                          NASNU178   367
         GO TO 250
      170 KG(I)=A(I+2)+0.5                          NASNU179   368
         GO TO 250
      170 KG(I)=A(I+2)+0.5                          NASNU180   369
         GO TO 250
      170 KG(I)=A(I+2)+0.5                          NASNU181   370
         GO TO 250
      170 KG(I)=A(I+2)+0.5                          NASNU182   371
         GO TO 250
      170 KG(I)=A(I+2)+0.5                          NASNU183   372
         GO TO 250
      170 KG(I)=A(I+2)+0.5                          NASNU184   373
         GO TO 250
      170 KG(I)=A(I+2)+0.5                          NASNU185   374
         GO TO 250
      170 KG(I)=A(I+2)+0.5                          NASNU186   375
         GO TO 250
      170 KG(I)=A(I+2)+0.5                          NASNU187   376
         GO TO 250
      170 KG(I)=A(I+2)+0.5                          NASNU188   377
         GO TO 250
      170 KG(I)=A(I+2)+0.5                          NASNU189   378
         GO TO 250
      170 KG(I)=A(I+2)+0.5                          NASNU190   379
         GO TO 250
      170 KG(I)=A(I+2)+0.5                          NASNU191   380
         GO TO 250
      170 KG(I)=A(I+2)+0.5                          NASNU192   381
         GO TO 250
      170 KG(I)=A(I+2)+0.5                          NASNU193   382
         GO TO 250
      170 KG(I)=A(I+2)+0.5                          NASNU194   383
         GO TO 250
      170 KG(I)=A(I+2)+0.5                          NASNU195   384
         GO TO 250
      170 KG(I)=A(I+2)+0.5                          NASNU196   385
         GO TO 250
      170 KG(I)=A(I+2)+0.5                          NASNU197   386
         GO TO 250
      170 KG(I)=A(I+2)+0.5                          NASNU198   387
         GO TO 250
      170 KG(I)=A(I+2)+0.5                          NASNU199   388
         GO TO 250
      170 KG(I)=A(I+2)+0.5                          NASNU200   389
         GO TO 250
      170 KG(I)=A(I+2)+0.5                          NASNU201   390
         GO TO 250
      170 KG(I)=A(I+2)+0.5                          NASNU202   391
         GO TO 250
      170 KG(I)=A(I+2)+0.5                          NASNU203   392
         GO TO 250
      170 KG(I)=A(I+2)+0.5                          NASNU204   393
         GO TO 250
      170 KG(I)=A(I+2)+0.5                          NASNU205   394
         GO TO 250
      170 KG(I)=A(I+2)+0.5                          NASNU206   395
         GO TO 250
      170 KG(I)=A(I+2)+0.5                          NASNU207   396
         GO TO 250
      170 KG(I)=A(I+2)+0.5                          NASNU208   397
         GO TO 250
      170 KG(I)=A(I+2)+0.5                          NASNU209   398
         GO TO 250
      170 KG(I)=A(I+2)+0.5                          NASNU210   399
         GO TO 250
      170 KG(I)=A(I+2)+0.5                          NASNU211   400

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180 DO 190 I=1,2          NASNU212    401
   KG(I)=A(I+2)+0.5      NASNU213    402
190 LG(I)=A(I+6)+0.5      NASNU214    403
C SET LOOP=2 SINCE 2 ELEMENTS MAY BE DEFINED ON ONE CARD.
   LOOP=2                  NASNU215    404
   GO TO 250                NASNU216    405
C* CONROD,CFLUID2         NASNU217    406
200 DO 210 I=1,2          NASNU218    407
210 KG(I)=A(I+1)+0.5      NASNU219    408
   GO TO 250                NASNU220    409
C* CELAS1, CELAS2, CDAMP1, CDAMP2, CHASS1, CHASS2
220 KG(1)=A(3)+0.5        NASNU221    410
   KG(2)=A(5)+0.5        NASNU222    411
   GO TO 250                NASNU223    412
C PROCESS MPC CARDS.      NASNU224    413
230 NCON=NMPc              NASNU225    414
   KG(1)=A(2)+0.5        NASNU226    415
   KG(2)=A(5)+0.5        NASNU227    416
   I=2                     NASNU228    417
240 READ(8,10)F1A,(A(J),J=1,4),F10A      NASNU229    418
   IF(F10B(1).NE.F1A(1).OR.F10B(2).NE.F1A(2)) GO TO 250
   I=I+1                   NASNU230    419
   IF(I.GT.NMPc)GO TO 245
   F10B(1)=F10A(1)
   F10B(2)=F10A(2)
   KK=2
   IF(MOD(I,2).EQ.0)KK=1
   KG(I)=A(KK)+0.5
   GO TO 240                NASNU231    420
245 WRITE(6,246) NMPc      NASNU232    421
246 FORMAT(36H1 AN MPC EQUATION CONTAINS MORE THAN,I5,8H TERMS./
   + 14H FATAL ERROR.)      NASNU233    422
   CALL BOMBIT(5)           NASNU234    423
C PROCESS KG (AND LG IF LOOP=2) ARRAY.
250 DO 480 KK=1,LOOP      NASNU235    424
   IF(KK.FQ,1)GO TO 300
   DO 260 I=1,4            NASNU236    425
260 KG(I)=LG(I)           NASNU237    426
C SCATTER SEARCH AND CONVERT KG TO TEMPORARY SET OF INTERNAL NUMBERS.
300 CALL SCAT(KG,NCON,NEW,INV,II3,NORIG)
   IF(IYPE,NE,20)GO TO 420
C SAVE MPC GRID POINTS FOR LATER PROCESSING BY TIGER.
   NEQ=NEQ+1
   WRITE(11)KG
   GO TO 45
C FILL CONNECTION TABLE ARRAY IG.
420 IEND=NCON-1          NASNU244    433
   NEL=NEL+1
   DO 450 I=1,IEND        NASNU245    434
   L=I+1                  NASNU246    435
   DO 450 J=L,NCON        NASNU247    436
   CALL SETIG(KG(I),KG(J),IG,II1,NORIG)
450 CONTINUE                NASNU248    437
   IF(F1B(1).EQ.F10A(1).AND.F1B(2).EQ.F10A(2)) GO TO 40
   IF(NCON.GE.8) GO TO 40
   F1A(1)=F1B(1)
   F1A(2)=F1B(2)
   DO 495 I=1,4            NASNU249    438
495 A(I)=ATEMP(I)
   F10A(1)=F10B(1)
   F10A(2)=F10B(2)
   GO TO 45                NASNU250    439
500 NN=NEW
   IF(NEW.GT.0) GO TO 502
   WRITE(6,2)
   IPARAM(9)=4
   RETURN
502 IF(IPARAM(4).EQ.3)GO TO 505
C MODIFY CONNECTION TABLE TO ACCOUNT FOR MPC EQUATIONS.
   CALL TIGER(NEQ,IG,II1,ILD,NORIG)
   NDEP=NN
   CALL FIXIT(ILD,NDEP)
C GENERATE NEW IG AND NORIG ARRAYS.
505 CALL BRIGIT(IG,II1,INV,II3,INT,ICC,NORIG,IP)
C PRINT INTERNAL/EXTERNAL CORRESPONDENCE TABLE.
   LEN=50
   IF(IPARAM(10).EQ.5) GO TO 560
   J=0
510 WRITE(6,19)
520 J=J+1
   KEND=0
   DO 530 K=1,9,2
   L=J+LEN*(K-1)/2
   LINE(K)=L
   IF(L.GT.NEW) GO TO 550
   KEND=K+1
530 LINE(K+1)=NORIG(L)
550 CONTINUE
   IF(KEND.EQ.0)GO TO 560
   WRITE(6,11)(LINE(K),K=1,KEND)
   IF(MOD(J,LEN).NE.0)GO TO 520
   J=J+4*LEN
   IF(J.LT.NEH) GO TO 510
560 CONTINUE
C CONVERT ISTART,IGNORE,IFIRST FROM ORIGINAL TO INTERNAL NUMBERS.
   I=ISTA+IIG+IFIR
   IF(I.LE.0) GO TO 570
   CALL FLIP(ISTART,ISTA,INV,II3,ICC)
   CALL FLIP(IGNORE,IIG,INV,II3,ICC)
   CALL FLIP(IFIRST,IFIR,INV,II3,ICC)

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IF(IPARAM(10).EQ.5) GO TO 570
C PRINT INTERNAL NUMBERS FOR $-CARDS.
      WRITE(6,561)
      561 FORMAT(30H1 $ CARDS (INTERNAL NUMBERS) /)
      IF(ISTA.GT.0) WRITE(6,562) (ISTART(I),I=1,ISTA)
      IF(IIG .GT.0) WRITE(6,564) (IGNORE(I),I=1,IIG )
      IF(IFIR.GT.0) WRITE(6,566) (IFIRST(I),I=1,IFIR)
      562 FORMAT(9H $START ,2015/100(9X,2015/))
      564 FORMAT(9H $IGNORE ,2015/100(9X,2015/))
      566 FORMAT(9H $FIRST ,2015/100(9X,2015/))
      570 CONTINUE
C SET UP LIST OF POINTS TO IGNORE IN INT ARRAY.
      K=0
      IF(IPARAM(4).EQ.3) GO TO 920
      IF(NDEP.LE.0) GO TO 920
C MPC DEPENDENT POINTS FIRST.
      DO 915 I=1,NDEP
      J=ILD(I)
      IF(J.LE.0) GO TO 915
      K=K+1
      INT(K)=ICC(J)
      IF(K.GE.MAXGRD) CALL FIXIT(INT,K)
      915 CONTINUE
      920 IF(IGDEG.LE.0) GO TO 940
C GRID POINTS WITH DEGREE.GT.IGDEG SECOND.
      IF(IGDEG.GE.MM) GO TO 940
      CALL DEGREE(IG,III,INV)
C HERE, INV(I)=DEGREE OF GRID POINT I
      DO 930 I=1,NN
      IF(JNV(I).LE.IGDEG) GO TO 930
      K=K+1
      INT(K)=I
      IF(K.GE.MAXGRD) CALL FIXIT(INT,K)
      930 CONTINUE
      940 IF(IIG.LE.0) GO TO 960
C IGNORE POINTS THIRD.
      DO 950 I=1,IIG
      J=IGNORE(I)
      IF(J.LE.0) GO TO 950
      K=K+1
      INT(K)=J
      IF(K.GE.MAXGRD) CALL FIXIT(INT,K)
      950 CONTINUE
C K=NUMBER OF POINTS TO BE IGNORED BEFORE COMPRESSING LIST.
      960 IF(K.LE.0) GO TO 970
C DELETE POINTS LISTED IN INT ARRAY FROM CONNECTION TABLE IG.
      CALL MORRIS(INT,K,IG,III)
      970 CONTINUE
C RENUMBER NODES WITH SUBROUTINE SCHEME.
      IF(IPARAM(10).EQ.6) IARG(5)=1
      II8=II3/2
      CALL SECOND(TIM1)
      CALL SCHEME(IARG(1),IARG(2),IARG(3),IARG(4),IARG(5),IG,III,
      + JNV(1),JNV(II8+1),JNV(2*II8+1),JNV(3*II8+1),INT,ICC,ILD,IP)
      CALL SECOND(TIM2)
      TIM2=TIM2-TIM1
      IF(IPARAM(10).EQ.5) GO TO 580
      WRITE(6,15) TIM2
      WRITE(6,15) I9
      C WRITE NEW NASTRAN DATA DECK.
      580 READ(9,918
      WRITE(6,918
      IF(B(1).NE.9EGI) GO TO 580
      590 READ(9,918
      IF(B(1).GE.SEQG.OR.R(1).EQ.ENDD) GO TO 600
      WRITE(6,918
      GO TO 590
C WRITE SEQGP CARDS.
      600 KREM=MOD(NEW,4)
      IF(NEW.GE.4) GO TO 605
      KBEG=1
      GO TO 612
      605 IEND=NEW-KREM-3
      DO 610 K=1,IEND,4
      L=K+3
      610 WRITE(8,12) (NORIG(I),ILD(I),I=K,L)
      IF(KREM.EQ.0) GO TO 620
      KBEG=IEND+4
      612 DO 615 I=KBEG,NEW
      615 WRITE(8,8) NORIG(I),ILD(I)
C WRITE THE REMAINDER OF THE NASTRAN DECK.
      620 WRITE(8,918
      IF(B(1).EQ.ENDD) GO TO 700
      READ(9,918
      GO TO 620
      700 CONTINUE
      IF(IPARAM(10).EQ.5) GO TO 900
C PRINT ORIGINAL GRID POINT CONNECTION TABLE.
      MAXD=MM
      L=MAXD/11+1
      L=LEN/L
      705 FORMAT(10H1      GRID,5X,5H MAX,15X,13H*CONNECTIONS*,5X,
      + 23H(ORIGINAL GRID NUMBERS) /5X,
      + 20HPOINT COMP DLIST DEGR,11(8X,1H*) )
      710 FORMAT(10,315,11I9/25(25X,11I9/))
      DO 750 I=1,NN
      IF(MOD(I,L).EQ.1) WRITE(6,705)
      DO 720 J=1,MAXD
      720 IP(J)=0
C CALCULATE MOIST AND PRINT TABLE.

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MDIST=0          NASNU412    601
DO 725 J=1,MAXD  NASNU413    602
K=IUNPK(IG,MAXGRD*(J-1)+I,NBITIN)  NASNU414    603
IF(K.EQ.0) GO TO 725  NASNU415    604
MDIST=MAX0(MDIST,IABS(I-K))  NASNU416    605
IP(J)=NORIG(K)  NASNU417    606
725 CONTINUE  NASNU418    607
K=NORIG(I)  NASNU419    608
IP1=INV(I,1)  NASNU420    609
IP2=INV(MAXGRD+I,1)  NASNU421    610
750 WRITE(6,710) K,IP1,MDIST,IP2,(IP(J),J=1,MAXD)  NASNU422    611
C PRINT CONNECTION TABLE FOR RENUMERED NUMBERS.  NASNU423    612
DO 780 I=1,NEW  NASNU424    613
780 ICC(I)=ILD(I)  NASNU425    614
CALL SWITCH(IG,III1,INT,ICC,IP(1),IP(MAXDEG+1))  NASNU426    615
CALL DEGREE(IG,III1,JNV(II8+1))  NASNU427    616
L=COMPNT(IG,III1,JNV(1),JNV(II8+1),JNV(3*II8+1),ICC)  NASNU428    617
L=MAXD/26+1  NASNU429    618
L=LEN/L  NASNU430    619
805 FORMAT(37H1LABEL COMP MDIST DEGR CONNECTIONS ,10X,  NASNU431    620
     + 20H(RENUMBERED NUMBERS) )  NASNU432    621
810 FORMAT(5I6,20I5/ 25(25X,2I5/))  NASNU433    622
DO 850 I=1,NN  NASNU434    623
IF(MD0(I,L).EQ.1) WRITE(6,805)  NASNU435    624
DO 820 J=1,MAXD  NASNU436    625
820 IP(J)=0  NASNU437    626
C CALCULATE MDIST AND PRINT TABLE.  NASNU438    627
MDIST=0  NASNU439    628
DO 825 J=1,MAXD  NASNU440    629
K=IUNPK(IG,MAXGRD*(J-1)+I,NBITIN)  NASNU441    630
IF(K.EQ.0) GO TO 825  NASNU442    631
MDIST=MAX0(MDIST,IABS(I-K))  NASNU443    632
IP(J)=K  NASNU444    633
825 CONTINUE  NASNU445    634
C INV(I,1)=IC(I) BEFORE PACKING  NASNU446    635
C INV(MAXGRD+I,1)=IDEG(I) BEFORE PACKING  NASNU447    636
IP1=INV(I,1)  NASNU448    637
IP2=INV(MAXGRD+I,1)  NASNU449    638
850 WRITE(6,810) I,IP1,MDIST,IP2,(IP(J),J=1,MAXD)  NASNU450    639
900 RETURN  NASNU451    640
END  NASNU452    641
SUBROUTINE FLIP(LIST,N,INV,II3,ICC)  FLIP 2    642
C CONVERT $-ARRAY LIST OF LENGTH N FROM ORIGINAL TO INTERNAL NUMBERS.  FLIP 3    643
COMMON A/A, MAXGRD,MAXDEG,KMOD  FLIP 4    644
DIMENSION LIST(1),INV(II3,2),ICC(1)  FLIP 5    645
C CHECK FOR DUPLICATE AND ZERO ENTRIES AND REDUCE N IF NECESSARY.  FLIP 6    646
CALL FIXIT(LIST,N)  FLIP 7    647
IF(N.LE.0) RETURN  FLIP 8    648
DO 20 I=1,N  FLIP 9    649
J=LIST(I)  FLIP 10   650
IF(J.LE.0) GO TO 30  FLIP 11   651
LOC=J-1  FLIP 12   652
10 LOC=MOD(LOC,KMOD)+1  FLIP 13   653
IF(INV(LOC,1).EQ.0) GO TO 30  FLIP 14   654
IF(INV(LOC,1).NE.J) GO TO 10  FLIP 15   655
K=INV(LOC,2)  FLIP 16   656
LIST(I)=ICC(K)  FLIP 17   657
20 CONTINUE  FLIP 18   658
RETURN  FLIP 19   659
C ABORT BANDIT DUE TO ILLEGAL GRID POINT REFERENCE ON $-CONTROL CARD.  FLIP 20   660
30 WRITE(6,40) J  FLIP 21   661
40 FORMAT(11HGRID POINT ,I10,30H APPEARING ON A $ CARD IS NOT ,  FLIP 22   662
     + 25H A STRUCTURAL GRID POINT. /13H FATAL ERROR. )  FLIP 23   663
CALL BOMBIT(8)  FLIP 24   664
END  FLIP 25   665
SUBROUTINE GOOGAN(KA,KB,NIN,NOUT)  GOOGAN 2   666
C THIS ROUTINE READS A NASTRAN DATA DECK AND RIGHT-ADJUSTS ALL  GOOGAN 3   667
C BULK DATA IN ITS FIELDS.  GOOGAN 4   668
C IN ADDITION, THE CALLING ARGUMENTS PROVIDE THE FOLLOWING OPTIONS -  GOOGAN 5   669
C KA=1, PROCESS ALL CARDS IN THE NASTRAN DATA DECK, OR  GOOGAN 6   670
C =2, PROCESS ONLY THOSE CARDS WITH A C OR G IN COLUMN 1,  GOOGAN 7   671
C MPC CARDS, AND THOSE CONTINUATION CARDS WITH ALL  GOOGAN 8   672
C NUMERIC FIELDS. THE ENDDATA CARD IS WRITTEN IN ANY CASE.  GOOGAN 9   673
C KB = 1, CONVERT ALL 8 COLUMN FIELDS TO 16 COLUMN FIELDS, OR  GOOGAN10  674
C = 2, THE FIELD WIDTHS REMAIN UNCHANGED.  GOOGAN11  675
C NIN = THE LOGICAL UNIT FROM WHICH THE INPUT DECK IS READ.  GOOGAN12  676
C NOUT = THE LOGICAL UNIT ON WHICH THE OUTPUT IS WRITTEN.  GOOGAN13  677
C NEITHER NIN NOR NOUT ARE REWOUND IN THIS ROUTINE.  GOOGAN14  678
C IF AN ASTERISK APPEARS IN FIELD 1 AFTER THE MNEMONIC, IT IS LEFT-  GOOGAN15  679
C ADJUSTED AGAINST THE MNEMONIC.  GOOGAN16  680
C THE FOLLOWING TWO (2) CARDS ARE REQUIRED IN THE DATA DECK -  GOOGAN17  681
C (1) A BEGIN BULK CARD TO INDICATE THE BEGINNING OF THE  GOOGAN18  682
C BULK DATA DECK, AND  GOOGAN19  683
C (2) AN ENDDATA CARD TO INDICATE THE END OF THE DATA DECK.  GOOGAN20  684
C ALL CARDS PRECEDING THE BEGIN BULK CARD ARE WRITTEN ON NOUT IFF KA=1.  GOOGAN21  685
DIMENSION ANUM(10)  GOOGAN22  686
COMMON A(80),IP(40)  GOOGAN23  687
COMMON IA,IB,ICARD,IFLAG,J,JNB,L,MKHOLO,MKINSR,MKNIN  GOOGAN24  688
COMMON NBANK,NFIELD,I,ICOL,IFIELD,IPROC,ITYPE  GOOGAN25  689
COMMON K,KAST,KBLK,MKI,MKJ,NCOL,NIP,NN  GOOGAN26  690
COMMON A/A, MAXGRD,MAXDEG,KMOD,NMPC  GOOGAN27  691
COMMON /B/ IPARAM(20),IARG(5)  GOOGAN28  692
COMMON /DOL/ ISTART(100),IGNORE(100),IFIRST(100)  GOOGAN29  693
COMMON /DOL/ IDIM,ISTA,IIG,IFIR,IGOEG,ISCH  GOOGAN30  694
COMMON /NG/ NRIO  GOOGAN31  695
REAL M,N,II,LL,JJ,KK  GOOGAN32  696
INTEGER EOF  GOOGAN33  697
C DATA CARDS FOR ALPHABET (ALLOWS FOR FUTURE ADDITIONS TO  GOOGAN34  698
C USER OPTION LIST).  GOOGAN35  699
DATA B,C,D,E,G,M,N,P/1HB,1HC,1HD,1HE,1HG,1HM,1HP/  GOOGAN36  700

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DATA AA,II,LL,O,R/1HA,1HI,1HL,1HO,1HR/          GOOGAN37    701
DATA Q,S,T,U,Y/1HQ,1HS,1HT,1HU,1HY/          GOOGAN38    702
DATA F,H,JJ,KK/1HF,1HH,1HJ,1HK/          GOOGAN39    703
DATA V,W,X,Z/1HV,1HW,1HX,1HZ/          GOOGAN40    704
DATA ASTER,PLUS,BLANK,DOLLAR/1H*,1H+,1H ,1H$/   GOOGAN41    705
DATA ANUM/1HO,1H1,1H2,1H3,1H4,1H5,1H6,1H7,1H8,1H9/  GOOGAN42    706
DATA LFLAG/0/          GOOGAN43    707
DATA IROMB,IROM/0,0/          GOOGAN44    708
LFLAG=LFLAG+1          GOOGAN45    709
9 FORMAT(1H1)          GOOGAN46    710
10 FORMAT(80A1)          GOOGAN47    711
11 FORMAT(BA1,4(8X,8A1),3H*XZ,I5/3H*XZ,I5,4(8X,8A1),8A1)  GOOGAN48    712
ICARD=0          GOOGAN49    713
MKINSR=12          GOOGAN50    714
MKNIN=NIN          GOOGAN51    715
C READ EXECUTIVE OR CASE CONTROL CARD.          GOOGAN52    716
20 READ(NIN,10)A          GOOGAN53    717
IF(EOF(NIN).EQ.0)GO TO 21          GOOGAN54    718
IF(NIN.EQ.MKNIN)CALL BOMBIT(1)          GOOGAN55    719
MKHOLD=NIN          GOOGAN56    720
NIN=MKINSR          GOOGAN57    721
MKNIN=MKHOLD          GOOGAN58    722
GO TO 20          GOOGAN59    723
21 IFLAG=0          GOOGAN60    724
ICARD=ICARD+1          GOOGAN61    725
C PROCESS OUTPUT OPTION CARD, IF PRESENT.          GOOGAN62    726
IF(A(1).NE.DOLLAR)GO TO 26          GOOGAN63    727
IF(IFLAG.GT.1) GO TO 29          GOOGAN64    728
C LOOK FOR FIRST KEYWORD.          GOOGAN65    729
I TYPE=0          GOOGAN66    730
IF(A(2).EQ.P.AND.A(3).EQ.U)ITYPE=1          GOOGAN67    731
IF(A(2).EQ.H.AND.A(3).EQ.P)ITYPE=4          GOOGAN68    732
IF(A(2).EQ.S.AND.A(3).EQ.E)ITYPE=5          GOOGAN69    733
IF(A(2).EQ.R.AND.A(3).EQ.II)ITYPE=6          GOOGAN70    734
IF(A(2).EQ.N.AND.A(3).EQ.AA)ITYPE=8          GOOGAN71    735
IF(A(2).EQ.P.AND.A(3).EQ.R)ITYPE=10          GOOGAN72    736
IF(A(2).EQ.S.AND.A(3).EQ.C)GO TO 1100          GOOGAN73    737
IF(A(2).EQ.S.AND.A(3).EQ.T) GO TO 26          GOOGAN74    738
IF(A(2).EQ.D.AND.A(3).EQ.E) GO TO 1250          GOOGAN75    739
IF(A(2).EQ.F.AND.A(3).EQ.II) GO TO 1300          GOOGAN76    740
IF(A(2).EQ.II.AND.A(3).EQ.G) GO TO 1350          GOOGAN77    741
IF(A(2).EQ.G.AND.A(3).EQ.R) GO TO 1380          GOOGAN78    742
IF(A(2).EQ.AA.AND.A(3).EQ.T) ITYPE=12          GOOGAN79    743
IF(A(2).EQ.H.AND.A(3).EQ.AA) ITYPE=13          GOOGAN80    744
IF(A(2).NE.II.OR.A(3).NE.N)GO TO 1025          GOOGAN81    745
C INSERT CARDS FROM ALTERNATE FILE          GOOGAN82    746
IPARAM(11)=1          GOOGAN83    747
MKHOLD=NIN          GOOGAN84    748
NIN=MKINSR          GOOGAN85    749
MKNIN=MKHOLD          GOOGAN86    750
DO 1021 MKI=2,80          GOOGAN87    751
MKJ=81-MKI          GOOGAN88    752
1021 A(MKJ+1)=A(MKJ)          GOOGAN89    753
IPARAM(6)=4          GOOGAN90    754
1025 IF(IYPE.EQ.0)GO TO 26          GOOGAN91    755
C LOOK FOR SECOND KEYWORD.          GOOGAN92    756
I=3          GOOGAN93    757
22 I=I+1          GOOGAN94    758
IF(I.GE.79)GO TO 26          GOOGAN95    759
IF(A(I).NE.BLANK)GO TO 22          GOOGAN96    760
24 I=I+1          GOOGAN97    761
IF(I.GE.80)GO TO 26          GOOGAN98    762
IF(A(I).EQ.BLANK)GO TO 24          GOOGAN99    763
J=0          GOOGA100    764
IF(A(I).EQ.S.AND.A(I+1).EQ.E)J=1          GOOGA101    765
IF(A(I).EQ.AA.AND.A(I+1).EQ.LL)J=2          GOOGA102    766
IF(A(I).EQ.N.AND.A(I+1).EQ.O)J=3          GOOGA103    767
IF(A(I).EQ.Y.AND.A(I+1).EQ.E)J=4          GOOGA104    768
IF(A(I).EQ.H.AND.A(I+1).EQ.II) J=5          GOOGA105    769
IF(A(I).EQ.M.AND.A(I+1).EQ.AA) J=6          GOOGA106    770
IF(J.EQ.0)GO TO 26          GOOGA107    771
C SET PARAMETER.          GOOGA108    772
IPARAM(IYPE)=J          GOOGA109    773
GO TO 26          GOOGA110    774
C READ $SCHEME CARD.          GOOGA111    775
1100 CALL READIT(A,IP,NIP)          GOOGA112    776
ISCH=1          GOOGA113    777
I=MIN0(NIP,5)          GOOGA114    778
IF(I.EQ.0) GO TO 29          GOOGA115    779
DO 1110 J=1,I          GOOGA116    780
1110 IARG(J)=IP(J)          GOOGA117    781
C READ $START CARD.          GOOGA118    782
1200 CALL READIT(A,IP,NIP)          GOOGA119    783
I=ISTA          GOOGA120    784
ISTA=ISTA+NIP          GOOGA121    785
IF(ISTA.LE.IDIM) GO TO 1205          GOOGA122    786
IBOH=2          GOOGA123    787
ISTA=IDIM          GOOGA124    788
GO TO 29          GOOGA125    789
1205 DO 1210 J=1,NIP          GOOGA126    790
1210 ISTART(I+J)=IP(J)          GOOGA127    791
GO TO 29          GOOGA128    792
C READ $DEGREE CARD.          GOOGA129    793
1250 CALL READIT(A,IP,NIP)          GOOGA130    794
IGDEG=IP(1)          GOOGA131    795
GO TO 29          GOOGA132    796
C READ $FIRST CARD.          GOOGA133    797
1300 CALL READIT(A,IP,NIP)          GOOGA134    798
I=IFIR          GOOGA135    799
GOOGA136    800

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IFIR=IFIR+NIP          GOOGA137    801
IF(IFIR.LE.IDIM) GO TO 1308   GOOGA138    802
IBOM=2                 GOOGA139    803
IFIR=IDIM              GOOGA140    804
GO TO 29                GOOGA141    805
1308 DO 1310 J=1,NIP      GOOGA142    806
1310 IFIRST(I+J)=IP(J)    GOOGA143    807
GO TO 29                GOOGA144    808
C READ $IGNORE CARD.     GOOGA145    809
1350 CALL READIT(A,IP,NIP)  GOOGA146    810
    I=IIG
    IIG=IIG+NIP           GOOGA147    811
    IF(IIG.LE.IDIM) GO TO 1360  GOOGA148    812
    IBOM=2                 GOOGA149    813
    IIG=IDIM               GOOGA150    814
    GO TO 29                GOOGA151    815
1360 DO 1365 J=1,NIP      GOOGA152    816
1365 IGNORE(I+J)=IP(J)    GOOGA153    817
GO TO 29                GOOGA154    818
C READ $GRID CARD.       GOOGA155    819
1380 CALL READIT(A,IP,NIP)  GOOGA156    820
    NGRID=IP(1)
    GO TO 29                GOOGA157    821
C LOOK FOR BEGIN BULK CARD.  GOOGA158    822
1380 CALL READIT(A,IP,NIP)  GOOGA159    823
    NGRID=IP(1)
    GO TO 29                GOOGA160    824
C LOOK FOR BEGIN BULK CARD.  GOOGA161    825
26 I=0                  GOOGA162    826
27 I=I+1
    IF(I.GT.75)GO TO 29
    IF(A(I).EQ.BLANK)GO TO 27
    IF(A(I).NE.B)GO TO 29
    IF(A(I+1).NE.E)GO TO 29
    IF(A(I+2).NE.G)GO TO 29
    IF(A(I+3).NE.II)GO TO 29
    IFLAG=1
C LEFT-ADJUST BEGIN BULK CARD.  GOOGA163    827
    K=73-I
    DO 28 J=1,72
    IF(J.LE.K)A(J)=A(J+I-1)
    28 IF(J.GT.K)A(J)=BLANK
    IF(IFLAG.GT.1) GO TO 29
C REJECT ILLEGAL PARAMETERS AND SET TO DEFAULTS.  GOOGA164    828
    IF(IPARAM(1).NE.2.AND.IPARAM(1).NE.3) IPARAM(1)=1
    DO 1450 I=2,9
1450 IF(IPARAM(I).NE.4) IPARAM(I)=3
    IF(IPARAM(10).NE.6) IPARAM(10)=5
    IF(IPARAM(12).NE.3) IPARAM(12)=4
    IF(IPARAM(13).NE.4) IPARAM(13)=3
    CALL GRID(NGRID)
    I=ISTA+IIG+IFIR+ISCH+IGDEG
    IF(I.LE.0) GO TO 29
C CHECK FOR ILLEGAL SCHEME ARGUMENTS.  GOOGA165    829
    DO 1460 I=1,3
1460 IF(IARG(I).LT.1.OR.IARG(I).GT.MAXGRD) IBOMB=1
    IF(IARG(4).LT.2.OR.IARG(4).GT.3) IBOMB=1
    IF(IARG(5).LT.0.OR.IARG(5).GT.1) IBOMB=1
    WRITE(6,9)
    IF(ISCH.GT.0) WRITE(6,1500) (IARG(I),I=1,5)
1500 FORMAT(//,9H $SCHEME ,10I10/200(9X,10I10/))
    IF(ISTA.GT.0) WRITE(6,1505) (ISTART(I),I=1,ISTA)
1505 FORMAT(//,9H $START ,10I10/200(9X,10I10/))
    IF(IGDEG.GT.0) WRITE(6,1510) IGDEG
1510 FFORMAT(//,9H $DEGREE ,10I10/200(9X,10I10/))
    IF(IFIR.GT.0) WRITE(6,1515) (IFIRST(I),I=1,IFIR)
1515 FFORMAT(//,9H $FIRST ,10I10/200(9X,10I10/))
    IF(IIG.GT.0) WRITE(6,1520) (IGNORE(I),I=1,IIG)
1520 FFORMAT(//,9H $IGNORE ,10I10/200(9X,10I10/))
    IF(IBOMB.EQ.1) CALL BOMBIT(4)
    IF(IBOM.EQ.2) CALL BOMBIT(9)
29 IF(IKA.EQ.1)WRITE(NOUT,10)
    IF(IFLAG.EQ.0)GO TO 20
C RETURN IF RIGHT-ADJUSTING OF CARDS IS NOT NEEDED.
    IF(IPARAM(4).EQ.3.AND.IPARAM(6).EQ.3)RETURN
C READ BULK DATA CARD.
30 READ(NIN,10)
    IF(EOP(NIN).EQ.0)GO TO 31
    IF(NIN.EQ.MKNIN) CALL BOMBIT(1)
C SWITCH INPUT FILES
    MKHOLD=NIN
    NIN=MKINSR
    MKINSR=MKHOLD
    GO TO 30
31 ICARD=ICARD+1
C LEFT-ADJUST FIRST FIELD.
    DO 1600 I=1,8
    IF(A(I).NE.BLANK) GO TO 1610
1600 CONTINUE
    GO TO 30
1610 IF(I.EQ.1) GO TO 1650
    J=I-1
    K=8-J
    DO 1620 I=1,K
    A(I)=A(I+J)
1620 A(I+J)=BLANK
1650 CONTINUE
C LOOK FOR SEQGP CARD.
    IF(A(1).EQ.S.AND.A(2).EQ.E.AND.A(3).EQ.Q.AND.A(4).EQ.G)IPARAM(7)=4
C LOOK FOR COMMENT CARD.
    IF(A(1).EQ.DOLLAR.AND.KA.EQ.1)GO TO 35
C LOOK FOR ENDDATA CARD.
    I=0
32 I=I+1

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IF(I.GT.75)GO TO 35
IF(A(I).EQ.BLANK)GO TO 32
IF(A(I).NE.E)GO TO 40
IF(A((I+1).NE.N)GO TO 40
IF(A((I+2).NE.0)GO TO 40
IF(A((I+3).NE.D)GO TO 40
C LEFT-ADJUST ENODATA CARD.
K=73-I
DO 33 J=1,72
IF(J.LE.K)A(J)=A(J+I-1)
33 IF(J.GT.K)A(J)=BLANK
WRITE(NOUT,10)A
RETURN
35 WRITE(NOUT,10)A
GO TO 30
C DETERMINE IF CARD IS TO BE PROCESSED.
40 IF(KA.EQ.1)GO TO 150
IF(A(1).EQ.C.OR.A(1).EQ.G)GO TO 150
IF(A(1).EQ.M.AND.A(2).EQ.P)GO TO 150
NCOL=8
IF(A(1).EQ.ASTER)GO TO 50
IF(A(1).EQ.PLUS)GO TO 60
GO TO 30
50 NCOL=16
60 NFIELD=64/NCOL
I=0
70 I=I+1
IF(I.GT.NFIELD)GO TO 150
IPROC=0
IFLAG=0
J=0
80 J=J+1
IF(IPROC.EQ.1)GO TO 70
IF(J.LE.NCOL)GO TO 90
IF(IFLAG.EQ.1)GO TO 30
GO TO 70
90 ICOL=8+NCOL*(I-1)+J
IF(A(ICOL).EQ.BLANK)GO TO 80
IFLAG=1
DO 100 L=1,10
100 IF(A(ICOL).EQ.ANUM(L))IPROC=1
GO TO 80
C PROCESS FIRST FIELD.
150 NCOL=8
KAST=8
KBLK=8
DO 160 I=1,8
IF(A(I).NE.BLANK.AND.A(I).NE.ASTER.AND.A(I+1).EQ.BLANK)KBLK=I+1
IF(A(I).EQ.ASTER)KAST=I
160 IF(A(I).EQ.ASTER)NCOL=16
IF(A(I).EQ.PLUS)NCOL=8
IF(NCOL.EQ.16)GO TO 170
IF(KB.EQ.2)GO TO 200
IF(A(I).NE.PLUS)A(KBLK)=ASTER
IF(A(I).EQ.PLUS)A(I)=ASTER
GO TO 200
170 IF(A(I).EQ.ASTER)GO TO 200
IA=MIN0(KAST,KBLK)
IB=MAX0(KAST,KBLK)
A(IB)=BLANK
A(IA)=ASTER
C RIGHT-ADJUST ALL BULK DATA WHICH IS TO BE PROCESSED.
200 NFIELD=64/NCOL
IFIELD=0
210 IFIELD=IFIELD+1
IF(IFIELD.GT.NFIELD)GO TO 300
I=0
220 I=I+1
IF(I.GT.NCOL)GO TO 210
ICOL=8+NCOL*IFIELD-I
IF(A(ICOL).EQ.BLANK)GO TO 220
NBLANK=I-1
NN=NCOL-NBLANK
DO 230 I=1,NCOL
J=9+NCOL*IFIELD-I
JNB=J-NBLANK
IF(I.LE.NN)A(J)=A(JNB)
IF(I.GT.NN)A(J)=BLANK
230 CONTINUE
GO TO 210
C WRITE NEW CARD.
300 IF(KB.EQ.1) A(73)=ASTER
IF(NCOL.EQ.8.AND.KB.EQ.1)GO TO 310
WRITE(NOUT,10)A
GO TO 30
310 WRITE(NOUT,11)(A(I),I=1,40),ICARD,ICARD,(A(I),I=41,80)
GO TO 30
END
SUBROUTINE GRID(NGRID)
C PARTITION EXPANDABLE CORE.
COMMON /BITS/ NBITIN,NBITEX
COMMON /A/ MAXGRD,MAXDEG
COMMON /K/ II(7),KOR
MAX=16384
N=NGRID
IF(N.GT.2045) NBITIN=15
IF(N.LE.510) NBITIN=10
IF(N.LT.100) N=100
IF(N.GT.MAX) GO TO 40
C CALCULATE WIDTH II(2) OF IG MATRIX.

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GOOGA237	901
GOOGA238	902
GOOGA239	903
GOOGA240	904
GOOGA241	905
GOOGA242	906
GOOGA243	907
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GOOGA245	909
GOOGA246	910
GOOGA247	911
GOOGA248	912
GOOGA249	913
GOOGA250	914
GOOGA251	915
GOOGA252	916
GOOGA253	917
GOOGA254	918
GOOGA255	919
GOOGA256	920
GOOGA257	921
GOOGA258	922
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GOOGA264	928
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GOOGA266	930
GOOGA267	931
GOOGA268	932
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GOOGA270	934
GOOGA271	935
GOOGA272	936
GOOGA273	937
GOOGA274	938
GOOGA275	939
GOOGA276	940
GOOGA277	941
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GOOGA301	965
GOOGA302	966
GOOGA303	967
GOOGA304	968
GOOGA305	969
GOOGA306	970
GOOGA307	971
GOOGA308	972
GOOGA309	973
GOOGA310	974
GOOGA311	975
GOOGA312	976
GOOGA313	977
GOOGA314	978
GOOGA315	979
GOOGA316	980
GOOGA317	981
GOOGA318	982
GOOGA319	983
GOOGA320	984
GOOGA321	985
GOOGA322	986
GOOGA323	987
GOOGA324	988
GRID 2	989
GRID 3	990
GRID 4	991
GRID 5	992
GRID 6	993
GRID 7	994
GRID 8	995
GRID 9	996
GRID 10	997
GRID 11	998
GRID 12	999
GRID 13	1000

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20 L=60/NBITIN          GRID 14    1001
M=60/NBTIX           GRID 15    1002
N=N+L*M-1           GRID 16    1003
N=N+MOD(N,L*M)      GRID 17    1004
MAXGRD=N            GRID 18    1005
C I=PACKED LENGTH FOR INTERNAL NUMBER.      GRID 19    1006
C J=PACKED LENGTH FOR ORIGINAL NUMBER.      GRID 20    1007
I=N/L               GRID 21    1008
J=N/M               GRID 22    1009
C SET UP DIMENSIONS IN II ARRAY, WHERE IG(II1,II2),INV(II3,2),
C INT(II4),ICC(II5),IL0(II6),NORIG(II7)      GRID 23    1010
C II(1)=I           GRID 24    1011
II(3)=2*I          GRID 25    1012
II(4)=J           GRID 26    1013
II(5)=J           GRID 27    1014
II(6)=J           GRID 28    1015
II(7)=J           GRID 29    1016
I=2*II(3)+II(4)+II(5)+II(6)+II(7)      GRID 30    1017
II(2)=(KOR-I)/(II(1)+2)      GRID 31    1018
C DENOMINATOR CONTAINS A 2 TO ALLOW FOR 2 SCRATCH ARRAYS, EACH OF
C LENGTH MAXDEG.      GRID 32    1019
II(2)=MIN0(II(2),N-1)      GRID 33    1020
MAXDEG=II(2)          GRID 34    1021
RETURN              GRID 35    1022
GRID 36    1023
GRID 37    1024
GRID 38    1025
GRID 39    1026
GRID 40    1027
50 WRITE(6,50) NGRID,N      GRID 41    1028
50 FORMAT(23H1BANDIT WARNING MESSAGE/10X,6H$GRID ,I10,5X,
+        9HTOO LARGE /10X,6H$GRID ,I10,5X,12HSUBSTITUTED.)      GRID 42    1029
GO TO 20
END
SUBROUTINE READIT(A,IP,NIP)
C THIS ROUTINE READS AND STORES (IN IP) NUMERIC DATA APPEARING ON
C $-CONTROL CARDS UP TO COLUMN 72.
DIMENSION ANUM(10)
DIMENSION A(1),IP(1)
DATA ANUM/1H0,1H1,1H2,1H3,1H4,1H5,1H6,1H7,1H8,1H9/
C INITIALIZE ARRAY.
NIP=0
DO 10 I=1,40
10 IP(I)=0
I=3
DO 70 KOUNT=1,40
NUM=0
NUMFL=0
20 I=I+1
IF(I.LE.72) GO TO 30
IF(NUMFL.EQ.1) GO TO 60
RETURN
30 K=99
DO 40 J=1,10
40 IF(A(I).EQ.ANUM(J)) K=J-1
IF(K.NE.99) GO TO 50
IF(NUMFL) 60,20,60
50 NUMFL=1
NUM=10*NUM+K
GO TO 20
60 NIP=KOUNT
IP(NIP)=NUM
70 CONTINUE
NIP=40
RETURN
END
SUBROUTINE BOMBIT(IERR)
C BOMB BANDIT TO SUPPRESS THE EXECUTION OF NASTRAN.
COMMON /B/ IPARAM(20)
COMMON /KA/ II(7),KORE,IFL
3 FORMAT(*-CURRENT FIELD LENGTH (FL) = *,06,*B*/
+ * THIS BANDIT JOB MAY REQUIRE A LARGER FIELD LENGTH (FL)/*
+ * THEREFORE, MAKE THE FOLLOWING CHANGES/*
+ *      1. INCREASE THE FL/*
+ *      2. INSERT A NOREDUCE. CARD IMMEDIATELY BEFORE THE *,
+ *BANDIT. CARD/*
+ *      3. INSERT A $GRID N CARD SOMEWHERE BEFORE THE BEGIN*,,
+ * BULK CARD, WHERE THE INTEGER N IS AN UPPER BOUND (PREFERABLY /*
+ *      LEAST UPPER BOUND) ON THE NUMBER OF GRID POINTS*)
5 FORMAT(200(1H+,130X/))
CALL REMARK(40H *****)*
GO TO (10,20,30,40,50,60,70,80,90), IERR
EOF ENCOUNTERED.
10 WRITE(6,12)
12 FORMAT(55H1BANDIT FATAL ERROR -      MISSING BEGIN BULK OR ENDDATA,BOMBIT19
+       6H CARD. )      BOMBIT20
+ CALL REMARK(39H **MISSING BEGIN BULK OR ENDDATA CARD )      BOMBIT21
GO TO 500
C BULK DATA CARD OUT OF SORT.
20 CALL REMARK(31H **BULK DATA CARD OUT OF SORT )
GO TO 500
C SEQGP CARDS IN DECK AND RESEQUENCING REQUESTED.
30 CALL REMARK(32H **SEQGP CARDS ALREADY IN DECK )
GO TO 500
C $SCHEME ILLEGAL ARGUMENTS.
40 WRITE(6,42)
42 FORMAT(46H1BANDIT FATAL ERROR -      ILLEGAL ARGUMENTS ON,
+       14H $SCHEME CARD. )
CALL REMARK(30H **ILLEGAL $SCHEME ARGUMENTS )
GO TO 500
C TOO MANY TERMS IN MPC EQUATION.
50 CALL REMARK(36H **MPC EQUATION HAS TOO MANY TERMS )
GO TO 500

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C MAXDEG EXCEEDED.
60 CALL REMARK(28H    **MAXIMUM DEGREE EXCEEDED )
      WRITE(6,3) IFL
      GO TO 500
C MAXGRD EXCEEDED.
70 CALL REMARK(39H    **MAX NUMBER OF GRID POINTS EXCEEDED )
      WRITE(6,3) IFL
      GO TO 500
C NON-EXISTENT GRID POINT REFERENCE ON $-CARD
80 CALL REMARK(32H    **ILLEGAL REFERENCE ON $-CARD )
      GO TO 500
C TOO MANY GRID POINTS ON $-CARD.
90 WRITE(6,92)
92 FORMAT(15H1BANDIT FATAL ERROR -    TOO MANY POINTS ON $-CARD)
      CALL REMARK(30H    **TOO MANY POINTS ON $-CARD )
      GO TO 500
C ABORT BANDIT.
500 CALL REMARK(17H    **BANDIT ABORT )
      CALL REMARK(23H    **NASTRAN SUPPRESSED )
      CALL REMARK(40H    ***** )
      WRITE(6,5)
      CALL ABT
      STOP
      END
      SUBROUTINE SCAT(KG,NCON,NEW,INV,II3,NORIG)
C THIS ROUTINE USES SCATTER SORT TECHNIQUES FOR EACH GRID POINT
C ENCOUNTERED TO DETERMINE WHETHER OR NOT THE POINT HAS
C BEEN SEEN BEFORE. IF NOT, INV, NORIG, AND NEW ARE UPDATED.
C INV(I,1) CONTAINS AN ORIGINAL GRID POINT NUMBER
C INV(I,2) CONTAINS THE INTERNAL NUMBER ASSIGNED TO IT (BEFORE SORTING)
      DIMENSION INV(II3,2),NORIG(1)
      COMMON /A/ MAXGRD,MAXDEG,KMOD
      DIMENSION KG(1)
      DO 100 I=1,NCON
      NOLD=KG(I)
      IF(NOLD.EQ.0)GO TO 100
      LOC=NOLD-1
      10 LOC=MOD(LOC,KMOD)+1
      20 IF(INV(LOC,1).NE.0) GO TO 30
      INV(LOC,1)=NOLD
      NEW=NEW+1
      IF(NEW.GT.MAXGRD) GO TO 150
      NORIG(NEW)=NOLD
      INV(LOC,2)=NEW
      GO TO 40
      30 IF(INV(LOC,1).NE.NOLD) GO TO 10
      40 KG(I)=INV(LOC,2)
      100 CONTINUE
      RETURN
      150 WRITE(6,160) MAXGRD
      160 FORMAT(35H1 THIS STRUCTURE CONTAINS MORE THAN,I6,
      + 14H GRID POINTS. /14H FATAL ERROR. )
      CALL BOMBIT(7)
      END
      SUBROUTINE BRIGIT(IG,III,INV,II3,INT,ICC,NORIG,IP)
C THIS ROUTINE GENERATES A NEW INTERNAL/EXTERNAL CORRESPONDENCE
C TABLE NORIG AND CONNECTION TABLE IG SUCH THAT THE NEW INTERNAL
C NUMBERS CORRESPOND TO A SORT OF THE ORIGINAL NUMBERS INTO
C ASCENDING ORDER.
C INPUT - IG,INV,NORIG
C OUTPUT - IG,NORIG,ICC
C SCRATCH - INT,IP
      DIMENSION IG(II1,1),INV(II3,2)
      DIMENSION INT(1),ICC(1),NORIG(1),IP(1)
      COMMON /S/ NN,MM,IH,IB
      COMMON /A/ MAXGRD,MAXDEG,KMOD,NMPC
      COMMON /BITS/ NBITIN,NBITEX,IPASS
      REWIND 8
C PERFORM A ROUGH SORT OF THE ORIGINAL GRID NUMBERS.
      L=0
      KFAC=-1
      20 KFAC=KFAC+1
      MIN=2147483647
      DO 50 I=1,KMOD
      IF(INV(I,1).GT.(KFAC*KMOD))
      +      MIN=MINU(MIN,INV(I,1))
      50 CONTINUE
      KFAC=(MIN-1)/KMOD
      DO 80 I=1,KMOD
      IS=INV(I,1)
      IF(IS.LE.(KFAC*KMOD).OR.IS.GT.(KFAC+1)*KMOD)GO TO 80
      L=L+1
      INT(L)=INV(I,1)
      80 CONTINUE
      IF(L.LT.NN)GO TO 20
C COMPLETE THE SORTING OF THE ORIGINAL GRID NUMBERS.
      CALL SORT(INT,NN)
C DETERMINE CORRESPONDENCE (ICC) BETWEEN NORIG AND INT ARRAYS.
      DO 130 I=1,NN
      L=INT(I)
      LOC=L-1
      .110 LOC=MOD(LOC,KMOD)+1
      120 IF(INV(LOC,1).NE.L) GO TO 110
      M=INV(LOC,2)
      ICC(M)=I
      130 CONTINUE
C TRANSFER INT ARRAY TO NORIG ARRAY.
      DO 220 I=1,NN
      220 NORIG(I)=INT(I)
C CHANGE IG MATRIX ACCORDING TO CORRESPONDENCE TABLE ICC.
      BOMBIT39      1101
      BOMBIT40      1102
      BOMBIT41      1103
      BOMBIT42      1104
      BOMBIT43      1105
      BOMBIT44      1106
      BOMBIT45      1107
      BOMBIT46      1108
      BOMBIT47      1109
      BOMBIT48      1110
      BOMBIT49      1111
      BOMBIT50      1112
      BOMBIT51      1113
      BOMBIT52      1114
      BOMBIT53      1115
      BOMBIT54      1116
      BOMBIT55      1117
      BOMBIT56      1118
      BOMBIT57      1119
      BOMBIT58      1120
      BOMBIT59      1121
      BOMBIT65      1122
      BOMBIT66      1123
      BOMBIT67      1124
      SCAT 2        1125
      SCAT 3        1126
      SCAT 4        1127
      SCAT 5        1128
      SCAT 6        1129
      SCAT 7        1130
      SCAT 8        1131
      SCAT 9        1132
      SCAT 10       1133
      SCAT 11       1134
      SCAT 12       1135
      SCAT 13       1136
      SCAT 14       1137
      SCAT 15       1138
      SCAT 16       1139
      SCAT 17       1140
      SCAT 18       1141
      SCAT 19       1142
      SCAT 20       1143
      SCAT 21       1144
      SCAT 22       1145
      SCAT 23       1146
      SCAT 24       1147
      SCAT 25       1148
      SCAT 26       1149
      SCAT 27       1150
      SCAT 28       1151
      SCAT 29       1152
      SCAT 30       1153
      SCAT 31       1154
      BRIGIT 2      1155
      BRIGIT 3      1156
      BRIGIT 4      1157
      BRIGIT 5      1158
      BRIGIT 6      1159
      BRIGIT 7      1160
      BRIGIT 8      1161
      BRIGIT 9      1162
      BRIGIT10     1163
      BRIGIT11     1164
      BRIGIT12     1165
      BRIGIT13     1166
      BRIGIT14     1167
      BRIGIT15     1168
      BRIGIT16     1169
      BRIGIT17     1170
      BRIGIT18     1171
      BRIGIT19     1172
      BRIGIT20     1173
      BRIGIT21     1174
      BRIGIT22     1175
      BRIGIT23     1176
      BRIGIT24     1177
      BRIGIT25     1178
      BRIGIT26     1179
      BRIGIT27     1180
      BRIGIT28     1181
      BRIGIT29     1182
      BRIGIT30     1183
      BRIGIT31     1184
      BRIGIT32     1185
      BRIGIT33     1186
      BRIGIT34     1187
      BRIGIT35     1188
      BRIGIT36     1189
      BRIGIT37     1190
      BRIGIT38     1191
      BRIGIT39     1192
      BRIGIT40     1193
      BRIGIT41     1194
      BRIGIT42     1195
      BRIGIT43     1196
      BRIGIT44     1197
      BRIGIT45     1198
      BRIGIT46     1199
      BRIGIT47     1200

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CALL SWITCH(IG,III,INT,ICC,IP(1),IP(MAXDEG+1))          BRIGIT48    1201
REWIND 8
RETURN
END
SUBROUTINE SORT(LIST,NL)                                BRIGIT49    1202
C THIS SUBROUTINE SORTS A LIST OF LENGTH NL AND IS BIASED TOWARDS THOSE
C LISTS NOT BADLY OUT OF SORT.                            BRIGIT50    1203
DIMENSION LIST(1)                                       BRIGIT51    1204
IF(NL.LE.1) RETURN                                     SORT 2      1205
NL1=NL-1
DO 20 I=1,NL1                                         SORT 3      1206
K=NL-I
KFLAG=0
DO 10 J=1,K                                         SORT 4      1207
IF(LIST(J).LE.LIST(J+1)) GO TO 10
KFLAG=1
L=LIST(J)
LIST(J)=LIST(J+1)
LIST(J+1)=L
10 CONTINUE
IF(KFLAG.EQ.0) RETURN                                 SORT 5      1208
20 CONTINUE
RETURN
END
SUBROUTINE SETIG(KG1,KG2,IG,III,NORIG)                  SORT 6      1209
C THIS ROUTINE SETS IG(KG1,-)=KG2 AND IG(KG2,-)=KG1 IF THIS
C CONNECTION HAS NOT ALREADY BEEN SET.                 SORT 7      1210
DIMENSION IG(III,1),NORIG(1)                           SORT 8      1211
COMMON /S/ NN,MM,IH,IB                                SORT 9      1212
COMMON /A/ MAXGRD,MAXDEG,KMOD,NMPC                  SORT 10     1213
COMMON /BITS/ NBITIN,NBITEX,IPASS                     SORT 11     1214
IF(KG1.EQ.0)RETURN                                    SORT 12     1215
IF(KG2.EQ.0)RETURN                                    SORT 13     1216
IF(KG1.EQ.KG2)RETURN                                  SORT 14     1217
DO 50 LOOP=1,2
L=KG1
K=KG2
IF(LOOP.EQ.1) GO TO 20
L=KG2
K=KG1
20 M=0
30 M=M+1
IF(M.GT.MAXDEG) GO TO 60
IS=IUNPK(IG,MAXGRD*(M-1)+L,NBITIN)
IF(IS.EQ.0) GO TO 40
IF(IS.NE.K) GO TO 30
GO TO 50
40 CALL PACK(IG,MAXGRD*(M-1)+L,NBITIN,K)
MM=MAXD(MM,M)
50 CONTINUE
RETURN
60 WRITE(6,70) NORIG(L),MAXDEG
70 FORMAT(12H1 GRID POINT,I12,2H HAS DEGREE GREATER THAN,I6/
+ 14H FATAL ERROR. )
CALL BOMBIT(16)
END
SUBROUTINE TIGER(NEQ,IG,III,LIST,NORIG)                SETIG 2      1220
C THIS ROUTINE MAKES ADDITIONS TO THE CONNECTION TABLE IG TO REFLECT
C THE PRESENCE OF MPC'S AND STORES THE DEPENDENT POINTS IN LIST.
C NEQ=NUMBER OF MPC EQUATIONS.
DIMENSION IG(III,1),LIST(1),NORIG(1)                SETIG 3      1221
COMMON /S/ NN,MM,IH,IB                                SETIG 4      1222
COMMON /A/ MAXGRD,MAXDEG,KMOD,NMPC                  SETIG 5      1223
COMMON /BITS/ NBITIN,NBITEX,IPASS                     SETIG 6      1224
IF(NEQ.EQ.0)RETURN                                    SETIG 7      1225
SETIG 8      1226
SETIG 9      1227
SETIG 10     1228
SETIG 11     1229
SETIG 12     1230
SETIG 13     1231
SETIG 14     1232
SETIG 15     1233
SETIG 16     1234
SETIG 17     1235
SETIG 18     1236
SETIG 19     1237
SETIG 20     1238
SETIG 21     1239
SETIG 22     1240
SETIG 23     1241
SETIG 24     1242
SETIG 25     1243
SETIG 26     1244
SETIG 27     1245
SETIG 28     1246
SETIG 29     1247
SETIG 30     1248
SETIG 31     1249
SETIG 32     1250
SETIG 33     1251
SETIG 34     1252
SETIG 35     1253
SETIG 36     1254
SETIG 37     1255
SETIG 38     1256
TIGER 2      1257
TIGER 3      1258
TIGER 4      1259
TIGER 5      1260
TIGER 6      1261
TIGER 7      1262
TIGER 8      1263
TIGER 9      1264
TIGER 10     1265
TIGER 11     1266
TIGER 12     1267
TIGER 13     1268
TIGER 14     1269
TIGER 15     1270
TIGER 16     1271
TIGER 17     1272
TIGER 18     1273
TIGER 19     1274
TIGER 20     1275
TIGER 21     1276
TIGER 22     1277
TIGER 23     1278
TIGER 24     1279
TIGER 25     1280
TIGER 26     1281
TIGER 27     1282
SWITCH 2     1283
SWITCH 3     1284
SWITCH 4     1285
SWITCH 5     1286
SWITCH 6     1287
SWITCH 7     1288
SWITCH 8     1289
SWITCH 9     1290
SWITCH10    1291
SWITCH11    1292
SWITCH12    1293
SWITCH13    1294
SWITCH14    1295
SWITCH15    1296
SWITCH16    1297
SWITCH17    1298
SWITCH18    1299
SWITCH19    1300
C INPUT - IG,KT
C OUTPUT - IG
C SCRATCH - IFLAG,KA,KB
C
DIMENSION IG(III,1),IFLAG(1),KT(1),KA(1),KB(1)
COMMON /S/ NN,MM,IH,IB
COMMON /A/ MAXGRD,MAXDEG,KMOD,NMPC
COMMON /BITS/ NBITIN,NBITEX,IPASS
C KT=CORRESPONDENCE TABLE. KT(OLD) = NEW.
C KA,KB = TEMPORARY STORAGE ROWS.
DO 100 I=1,NN
DO 90 J=1,MM

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L=IUNPK(IG,MAXGRD*(J-1)+I,NBITIN)
IF(L.LE.0) GO TO 100
IS=KT(L)
CALL PACK(IG,MAXGRD*(J-1)+I,NBITIN,IS)
90 CONTINUE
100 CONTINUE
C INITIALIZE FLAGS.
DO 120 I=1,MN
120 IFLAG(I)=0
C INITIALIZE TEMPORARY STORAGE ROWS.
DO 130 I=1,MM
130 KB(I)=0
C RE-ORDER ROWS OF IG MATRIX.
DO 200 IROW=1,NN
IF(IFLAG(IROW).EQ.1) GO TO 200
IF(KT(IROW).EQ.IROW) GO TO 200
IFLAG(IROW)=1
DO 140 J=1,MM
140 KB(J)=IUNPK(IG,MAXGRD*(J-1)+IROW,NBITIN)
L=KT(IROW)
150 IFLAG(L)=1
DO 160 J=1,MM
KA(J)=IUNPK(IG,MAXGRD*(J-1)+L,NBITIN)
CALL PACK(IG,MAXGRD*(J-1)+L,NBITIN,KB(J))
160 KB(J)=KA(J)
M=KT(L)
IF(IFLAG(M).EQ.1) GO TO 170
L=M
GO TO 150
170 DO 180 J=1,MM
180 CALL PACK(IG,MAXGRD*(J-1)+M,NBITIN,KB(J))
200 CONTINUE
RETURN
END

SUBROUTINE MORRIS(LIST,NL,IG,II1)
C THIS ROUTINE DELETES ALL REFERENCE IN THE CONNECTION TABLE IG
C TO THOSE POINTS IN A LIST OF LENGTH NL.
DIMENSION IG(II1,1),LIST(1)
COMMON /S/ NN,MM
COMMON /A/ MAXRD
COMMON /BITS/ NBITIN,NBTEX
C COMPRESS OUT DUPLICATE ENTRIES IN LIST.
CALL FIXIT(LIST,NL)
IF(NL.LE.0) RETURN
MM1=MM-1
DO 60 IJ=1,NL
IJ=LIST(IJ)
DO 50 J=1,MM
L=IUNPK(IG,MAXGRD*(J-1)+I,NBITIN)
IF(L.EQ.0) GO TO 60
K=0
20 K=K+1
M=IUNPK(IG,MAXGRD*(K-1)+L,NBITIN)
IF(M.NE.I) GO TO 20
IF(K.GE.MM) GO TO 40
DO 30 NK=MM1,MM
IS=IUNPK(IG,MAXGRD*N+L,NBITIN)
30 CALL PACK(IG,MAXGRD*(N-1)+L,NBITIN,IS)
40 CALL PACK(IG,MAXGRD*MM1+L,NBITIN,0)
CALL PACK(IG,MAXGRD*(J-1)+I,NBITIN,0)
50 CONTINUE
60 CONTINUE
RETURN
END

SUBROUTINE FIXIT(LIST,NL)
C THIS ROUTINE COMPRESSES OUT ZEROES AND MULTIPLE ENTRIES IN A LIST
C ORIGINALLY OF LENGTH NL. A CORRECTED LENGTH NL IS RETURNED TO
C THE CALLING PROGRAM.
DIMENSION LTST(1)
IF(NL.LE.0) RETURN
IF(NL.EQ.1) GO TO 110
NL1=NL-1
C DELETE DUPLICATE ENTRIES.
DO 20 I=1,NL1
IF(LIST(I).EQ.0) GO TO 20
I1=I+1
DO 10 J=I1,NL
IF(LIST(I).NE.LIST(J)) GO TO 10
LIST(I)=0
GO TO 20
10 CONTINUE
20 CONTINUE
C DELETE ZEROES.
DO 40 I=1,NL1
K=0
25 IF(LIST(I).NE.0) GO TO 40
K=K+1
DO 30 J=I,NL1
LIST(J)=LIST(J+1)
LIST(NL)=0
IF(K.GE.(NL-I+1)) GO TO 70
GO TO 25
40 CONTINUE
C CALCULATE NEW LENGTH NL.
70 DO 80 I=1,NL
J=NL-I+1
IF(LIST(J).NE.0) GO TO 90
80 CONTINUE
90 NL=NL-I+1

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SWITCH20	1301
SWITCH21	1302
SWITCH22	1303
SWITCH23	1304
SWITCH24	1305
SWITCH25	1306
SWITCH26	1307
SWITCH27	1308
SWITCH28	1309
SWITCH29	1310
SWITCH30	1311
SWITCH31	1312
SWITCH32	1313
SWITCH33	1314
SWITCH34	1315
SWITCH35	1316
SWITCH36	1317
SWITCH37	1318
SWITCH38	1319
SWITCH39	1320
SWITCH40	1321
SWITCH41	1322
SWITCH42	1323
SWITCH43	1324
SWITCH44	1325
SWITCH45	1326
SWITCH46	1327
SWITCH47	1328
SWITCH48	1329
SWITCH49	1330
SWITCH50	1331
SWITCH51	1332
SWITCH52	1333
SWITCH53	1334
SWITCH54	1335
MORRIS 2	1336
MORRIS 3	1337
MORRIS 4	1338
MORRIS 5	1339
MORRIS 6	1340
MORRIS 7	1341
MORRIS 8	1342
MORRIS 9	1343
MORRIS10	1344
MORRIS11	1345
MORRIS12	1346
MORRIS13	1347
MORRIS14	1348
MORRIS15	1349
MORRIS16	1350
MORRIS17	1351
MORRIS18	1352
MORRIS19	1353
MORRIS20	1354
MORRIS21	1355
MORRIS22	1356
MORRIS23	1357
MORRIS24	1358
MORRIS25	1359
MORRIS26	1360
MORRIS27	1361
MORRIS28	1362
MORRIS29	1363
MORRIS30	1364
MORRIS31	1365
FIXIT 2	1366
FIXIT 3	1367
FIXIT 4	1368
FIXIT 5	1369
FIXIT 6	1370
FIXIT 7	1371
FIXIT 8	1372
FIXIT 9	1373
FIXIT 10	1374
FIXIT 11	1375
FIXIT 12	1376
FIXIT 13	1377
FIXIT 14	1378
FIXIT 15	1379
FIXIT 16	1380
FIXIT 17	1381
FIXIT 18	1382
FIXIT 19	1383
FIXIT 20	1384
FIXIT 21	1385
FIXIT 22	1386
FIXIT 23	1387
FIXIT 24	1388
FIXIT 25	1389
FIXIT 26	1390
FIXIT 27	1391
FIXIT 28	1392
FIXIT 29	1393
FIXIT 30	1394
FIXIT 31	1395
FIXIT 32	1396
FIXIT 33	1397
FIXIT 34	1398
FIXIT 35	1399
FIXIT 36	1400

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      RETURN
110 IF(LIST(1).EQ.0) NL=0
      RETURN
      END
      SUBROUTINE SCHEME(NT,NUM,NOM,IO,IP,IG,II1,IC,IDEGL,DISL,IW,
      + NEW,ICC,ILD,IPP)
C IO IS VALID IFF 2.LE.IO.LE.3
      DIMENSION IG(II1,1),IC(1),IDEGL(1),DISL(1),IW(1)
      DIMENSION NFW(1),ICC(1),ILD(1),IPP(1)
C IPP HAS DIMENSION 2*MAXDEG
      COMMON /S/ NN,MM,IH,IB
      COMMON /P/ IH0,IHE
      COMMON /A/ MAXGRD
      COMMON /C/ IWARN,LINE,KORIG,KNEW
      COMMON /BITS/ NBITIN,NBITEX,IPASS
      COMMON /TIME/ STIME,NCM
      COMMON /B/ IPARAM(20)
      COMMON /DOL/ ISTART(100),IGNORE(100),IFIRST(100)
      COMMON /DOLY/ IDIM,ISTA,IIIG,IFIR
      DIMENSION NODESL(100)
      EQUIVALENCE (IH,ATIME)
C DETERMINE THE DEGREE OF EACH NODE.
      CALL DEGREF(IG,II1,IDEGL)
C DETERMINE MODE, THE MOST PREVALENT NODAL DEGREE.
      MODE=MODE(IDEGL,IPP)
C DETERMINE THE NUMBER OF COMPONENTS, NCM.
      NCM=COMPNT(IG,II1,IC,IDEGL,IH,ICC)
C DETERMINE THE MAXIMUM DEGREE OF ANY NODE.
      MAXD=MAXDGR(0,IC,IDEGL)
      MM=MAXD
C DETERMINE THE ORIGINAL BANDWIDTH,IS.
      DO 30 I=1,NN
      NEW(I)=I
30 ILD(I)=I
      IS=MAXBND(0,IG,II1,IC,IDEGL,NEW,ILD)
      KORIG=IS
      IH=IH
C INITIALIZE NEW AND ILD ARRAYS.
      DO 35 I=1,NN
      NEW(I)=0
35 ILD(I)=0
C IF IP IS NOT EQUAL TO 0, THEN PRINT COMPONENT NUMBER,DEGREE,
C AND CONNECTIONS FOR EACH NODE.
      IF(IP.EQ.0) GO TO 31
C PRINT INTERNAL NUMBER CONNECTION TABLE.
      DO 60 I=1,NN
      IF(MOD(I,LINE).EQ.1) WRITE(6,19)
19 FORMAT(3TH1LABEL COMP MDIST DEGR CONNECTIONS ,10X,
      1 18H(INTERNAL NUMBERS) )
      MDIST=0
      DO 65 J=1,MAXD
      IS1=IUNPK(IG,MAXGRD*(J-1)+I,NBITIN)
      IF(IS1.EQ.0) GO TO 65
      MDIST=MAXD(MDIST,IABS(I-IS1))
65 CONTINUE
      IPP(1)=IC(I)
      IPP(2)=IDEGL(I)
      DO 610 610 IPP(1)=MAXD
      IPP(1)=IUNPK(IG,MAXGRD*(IP1-1)+I,NBITIN)
      IS1=MAXD+2
      60 WRITE(6,61) I,IPP(1),MDIST,(IPP(J),J=2,IS1)
      61 FORMAT(5I6,20I5/ 25(25X,21I5/))
      WRITE(6,700)
700 FORMAT(1H1//,32X,31HPROGRAMMER INFORMATION MESSAGES /)
      WRITE(6,29) IS,IH
      29 FORMAT(19H ORIGINAL BANDWIDTH,I7,10H PROFILE,I10)
      WRITE(6,27) MODE
      27 FORMAT(30H MODE OF DEGREE DISTRIBUTION =,I5)
      IF(ISTA.LE.0) GO TO 31
      WRITE(6,701)
      701 FORMAT(34H STARTING NODES SUPPLIED BY USER -)
      WRITE(6,100) (ISTART(I),I=1,ISTA)
C TEST TIMER.
      31 CALL SECOND(TBEG)
      IF(TO.EQ.3) IS=IH
C GENERATE NUMBERING SCHEME FOR EACH COMPONENT, NC.
      DO 500 NC=1,NCM
      500 NC=1,NCM
C DETERMINE THE RANGE OF DEGREES (MI TO MAD) OF NODES OF INTEREST.
      MI=MINDEG(NC,IC,IDEGL)
      SCHEME75 1478
      SCHEME76 1479
      SCHEME77 1480
      SCHEME78 1481
      SCHEME79 1482
      SCHEME80 1483
      SCHEME81 1484
      SCHEME82 1485
      SCHEME83 1486
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        WRITE(6,59) MAXLEV
        WRITE(6,100) (NODESL(J),J=1,NL)
67  CONTINUE
        IF(ISTA.LE.0) GO TO 760
        M=0
        DO 750 I=1,ISTA
        J=ISTART(I)
        IF(IC(J).NE.NC) GO TO 750
        M=M+1
        DO 755 K=1,99
        L=101-K
755  NODESL(L)=NODESL(L-1)
        NODESL(1)=J
750  CONTINUE
        NL=MIND(NL+M,100)
        CALL FIXIT(NODESL,NL)
760  CONTINUE
        IF(IP.EQ.0) GO TO 63
        IF(ISTA.LE.0) GO TO 63
        WRITE(6,730)
730  FORMAT(48H MERGED LIST OF STARTING NODES SUPPLIED BY USER ,
        + 15H AND BY BANDIT -)
        WRITE(6,100) (NODESL(I),I=1,NL)
39   FORMAT(10H COMPONENT,I5,19H MAX DEGREE USED,I5)
59   FORMAT(52H STARTING NODES FOR MINMAX NUMBER OF NODES PER LEVEL,I5)
100  FORMAT(4X,20I5)
63   CONTINUE
        JMAX=MIND(NT,NL)
        IM=900000000
        IMM=IM
        DO 400 J=1,JMAX
        CALL RELABL(1,NODESL(J),IG,III,IC,IDEGL,DISL,IW,NEW,ICC,ILD)
        IB=MAXBND(NC,IG,III,IC,IDEGL,DISL,IW)
        IF(IP.NE.0) WRITE(6,69) NODESL(J),IB,IH
69   FORMAT(14H STARTING NODE,I6,4X,9HBANDWIDTH,I6,3X,7HPROFILE,IB)
        IF(IO.EQ.3) IB=IH
        IE=ICC(NC+1)-1
        IF(IM-IB) 400,350,300
300  IM=IB
        IMM=IH
        IJ=J
        GO TO 400
350  IF(IMM.LE.IH) GO TO 400
        IMM=IH
        IJ=J
400  CONTINUE
        CALL RELABL(1,NODESL(IJ),IG,III,IC,IDEGL,DISL,IW,NEW,ICC,ILD)
500  CONTINUE
        CALL STACK(IDEGL,NEW,ILD,IW)
        IB=MAXBND(0,IG,III,IC,IDEGL,DISL,IW)
        IF(IP.EQ.0) GO TO 710
        WRITE(6,705)
705  FORMAT(21H0 ORIGINAL LABELING -)
        WRITE(6,707) KORIG,IHO
        WRITE(6,707)
707  FORMAT(21H STO CM RELABELING -)
        WRITE(6,708) IB,IH
708  FORMAT(1H+,26X,9HBANDWIDTH,I7,10X,7HPROFILE,I10)
709  FORMAT(21H REV CM RELABELING -)
710  IF(IO.EQ.3) IB=IH
C PROFILE = SUM CRIT
C IS=ORIGINAL BANDWIDTH (OR SUM CRIT IF IO.EQ.3)
C IB=CURRENT BANDWIDTH (OR SUM CRIT IF IO.EQ.3)
C IH=CURRENT PROFILE, IHO=ORIGINAL PROFILE
        IF(IB-IS) 715,742,744
742  IF(IH.LT.IHO) GO TO 715
744  DO 712 I=1,NN
        ILD(I)=I
712  NEW(I)=I
        CALL STACK(IDEGL,NEW,ILD,IW)
        IB=IS
        IH=IHO
        IF(IP.EQ.0) GO TO 715
        WRITE(6,713)
713  FORMAT(21H ORIG CM RELABELING -)
        WRITE(6,708) IB,IH
715  IHE=IH
        CALL REVERS(NEW,ILD)
        IB=MAXBND(0,IG,III,IC,IDEGL,DISL,IW)
        IF(IP.EQ.0) GO TO 717
        WRITE(6,709)
        WRITE(6,708) IB,IH
717  IF(IH.LT.IHE) GO TO 720
        CALL REVERS(NEW,ILD)
        IB=MAXBND(0,IG,III,IC,IDEGL,DISL,IW)
720  IHE=IH
        KNEW=IB
        IF(IP.EQ.0) GO TO 508
        WRITE(6,722)
722  FORMAT(21H ** FINAL LABELING -)
        WRITE(6,708) KNEW,IHE
508  CALL SECOND(ATIME)
        ATIME=ATIME-TBEG
        IF(IP.EQ.0) GO TO 600
        WRITE(6,59) ATIME
89   FORMAT(7H TIME =,F9.3,6H SEC.)
600  RETURN
        END
        SUBROUTINE STACK(IDEGL,NEW,ILD,IW)
C STACK POINTS OF ZERO DEGREE AT END OF THE NUMBERING.
        SCHEME98      1501
        SCHEME99      1502
        SCHEM100     1503
        SCHEM101     1504
        SCHEM102     1505
        SCHEM103     1506
        SCHEM104     1507
        SCHEM105     1508
        SCHEM106     1509
        SCHEM107     1510
        SCHEM108     1511
        SCHEM109     1512
        SCHEM110     1513
        SCHEM111     1514
        SCHEM112     1515
        SCHEM113     1516
        SCHEM114     1517
        SCHEM115     1518
        SCHEM116     1519
        SCHEM117     1520
        SCHEM118     1521
        SCHEM119     1522
        SCHEM120     1523
        SCHEM121     1524
        SCHEM122     1525
        SCHEM123     1526
        SCHEM124     1527
        SCHEM125     1528
        SCHEM126     1529
        SCHEM127     1530
        SCHEM128     1531
        SCHEM129     1532
        SCHEM130     1533
        SCHEM131     1534
        SCHEM132     1535
        SCHEM133     1536
        SCHEM134     1537
        SCHEM135     1538
        SCHEM136     1539
        SCHEM137     1540
        SCHEM138     1541
        SCHEM139     1542
        SCHEM140     1543
        SCHEM141     1544
        SCHEM142     1545
        SCHEM143     1546
        SCHEM144     1547
        SCHEM145     1548
        SCHEM146     1549
        SCHEM147     1550
        SCHEM148     1551
        SCHEM149     1552
        SCHEM150     1553
        SCHEM151     1554
        SCHEM152     1555
        SCHEM153     1556
        SCHEM154     1557
        SCHEM155     1558
        SCHEM156     1559
        SCHEM157     1560
        SCHEM158     1561
        SCHEM159     1562
        SCHEM160     1563
        SCHEM161     1564
        SCHEM162     1565
        SCHEM163     1566
        SCHEM164     1567
        SCHEM165     1568
        SCHEM166     1569
        SCHEM167     1570
        SCHEM168     1571
        SCHEM169     1572
        SCHEM170     1573
        SCHEM171     1574
        SCHEM172     1575
        SCHEM173     1576
        SCHEM174     1577
        SCHEM175     1578
        SCHEM176     1579
        SCHEM177     1580
        SCHEM178     1581
        SCHEM179     1582
        SCHEM180     1583
        SCHEM181     1584
        SCHEM182     1585
        SCHEM183     1586
        SCHEM184     1587
        SCHEM185     1588
        SCHEM186     1589
        SCHEM187     1590
        SCHEM188     1591
        SCHEM189     1592
        SCHEM190     1593
        SCHEM191     1594
        SCHEM192     1595
        SCHEM193     1596
        SCHEM194     1597
        SCHEM195     1598
        STACK 2      1599
        STACK 3      1600

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DIMENSION IDEG(1),NEW(1),ILD(1),IW(1)                      STACK  4   1601
C IW IS SCRATCH STORAGE.                                     STACK  5   1602
COMMON /S/ NN                                              STACK  6   1603
COMMON /ZERO/ KT                                           STACK  7   1604
KT=0                                                       STACK  8   1605
NN1=NN-1                                                 STACK  9   1606
C LIST POINTS OF ZERO DEGREE AND INCREMENT COUNTER KT.    STACK 10  1607
DO 10 I=1,NN                                              STACK 11  1608
IF(IDEGL(I).GT.0) GO TO 10                                STACK 12  1609
KT=KT+1                                                 STACK 13  1610
IW(KT)=ILD(I)                                            STACK 14  1611
10 CONTINUE                                               STACK 15  1612
IF(KT.LE.0) GO TO 70                                     STACK 16  1613
C SORT LIST OF RENUMBERED NUMBERS TO BE STACKED.          STACK 17  1614
CALL SORT(IW,KT)                                         STACK 18  1615
C STACK POINTS OF ZERO DEGREE AT END OF NEW.              STACK 19  1616
DO 40 L=1,KT                                              STACK 20  1617
IW(L)=L+1                                                STACK 21  1618
K=NEW(I)                                                 STACK 22  1619
IF(I.GE.NN) GO TO 30                                     STACK 23  1620
DO 20 J=I,NN1                                             STACK 24  1621
20 NEW(J)=NEW(J+1)                                         STACK 25  1622
30 NEW(NN)=K                                              STACK 26  1623
40 CONTINUE                                               STACK 27  1624
C CORRECT ILD, THE INVERSE OF NEW.                         STACK 28  1625
70 DO 80 I=1,NN                                           STACK 29  1626
K=NEW(I)                                                 STACK 30  1627
80 ILD(K)=I                                              STACK 31  1628
RETURN                                                 STACK 32  1629
END
SUBROUTINE REVERS(NEW,ILD)
C REVERSE THE NUMBERING OF THE FIRST NN-KT GRID POINTS.
C NN=NUMBER OF GRID POINTS.                               REVERS 2   1631
C KT=THE NUMBER OF POINTS OF ZERO DEGREE (STACKED AT END OF NEW
C      BY STACK)
DIMENSION NEW(1),ILD(1)                                    REVERS 3   1632
COMMON /S/ NN                                              REVERS 4   1633
COMMON /ZERO/ KT                                           REVERS 5   1634
C REVERSE NEW ARRAY.
J=(NN-KT)/2                                              REVERS 6   1635
LL=NN-KT+1                                              REVERS 7   1636
DO 10 I=1,J                                              REVERS 8   1637
L=LL-I                                                 REVERS 9   1638
K=NEW(L)                                                 REVERS10  1639
, NEW(L)=NEW(I)                                         REVERS11 1640
10 NEW(I)=K                                              REVERS12 1641
C CORRECT ILD, THE INVERSE OF NEW.
DO 20 I=1,NN                                              REVERS13 1642
K=NEW(I)                                                 REVERS14 1643
20 ILD(K)=I                                              REVERS15 1644
RETURN                                                 REVERS16 1645
END
SUBROUTINE DEGREE(IG,III1,IDEGL)
C SET UP THE IDEG ARRAY CONTAINING THE DEGREE OF EACH NODE STORED
C IN THE IG ARRAY.
C IDEG(I)=DEGREE OF NODE I                               DEGREE 2   1653
DIMENSION IG(III1,1),IDEGL(1)                            DEGREE 3   1654
COMMON /S/ NN,MM,IH,IB                                  DEGREE 4   1655
COMMON /A/ MAXGRD                                       DEGREE 5   1656
COMMON /BITS/ NBITIN,NBITEX,IPASS                      DEGREE 6   1657
DO 100 I=1,NN                                           DEGREE 7   1658
IDEGL(I)=0                                              DEGREE 8   1659
DO 80 J=1,MM                                           DEGREE 9   1660
IF(IUNPK(IG,MAXGRD*(J-1)+I,NBITIN)) 100,100,50
50 IDEGL(I)=IDEGL(I)+1                                 DEGREE10 1661
80 CONTINUE                                              DEGREE11 1662
100 CONTINUE                                             DEGREE12 1663
RETURN                                                 DEGREE13 1664
END
FUNCTION MODE(MODE,MODD)
C COMPUTE MODE, THE MOST PREVALENT NODAL DEGREE. IF SEVERAL DEGREES
C ARE EQUALY PREVALENT, THE LOWEST IS CHOSEN.
COMMON /S/ NN,MM                                       MODE  3   1671
DIMENSION IDEG(1),MODD(1)                                MODE  4   1672
C IDEG(I)=DEGREE OF NODE I                             MODE  5   1673
C MODD(I)=NUMBER OF NODES OF DEGREE I                  MODE  6   1674
DO 10 I=1,MM                                           MODE  7   1675
10 MODD(I)=0                                           MODE  8   1676
DO 20 I=1,NN                                           MODE  9   1677
20 K=IDEGL(I)                                         MODE 10  1678
MODD(K)=MODD(K)+1                                     MODE 11  1679
MODE=0                                                 MODE 12  1680
MAX=0                                                 MODE 13  1681
DO 30 I=1,MM                                           MODE 14  1682
30 K=MODD(I)                                         MODE 15  1683
IF(K.LE.MAX) GO TO 30                                 MODE 16  1684
MAX=K                                                 MODE 17  1685
MODE=I                                                 MODE 18  1686
30 CONTINUE                                              MODE 19  1687
RETURN                                                 MODE 20  1688
END
FUNCTION COMPNT(IG,III1,IC,IDEGL,IW,ICC)
C THIS FUNCTION HAS AS ITS VALUE THE NUMBER OF COMPONENTS STORED
C IN THE CONNECTION ARRAY IG.
C ALSO, IC AND ICC ARE SET UP.
C IC(I)=COMPONENT INDEX FOR NODE I
C ICC(I)=THE STARTING POSITION TO BE USED FOR LABELS IN COMPONENT I
C THUS, ICC(I+1)-ICC(I)= THE NUMBER OF NODES IN COMPONENT I
DIMENSION IG(III1,1),IC(1),IDEGL(1),IW(1),ICC(1)
COMMON /S/ NN,MM,IH,IB

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COMMON /A/ MAXGRD
COMMON /BITS/ NBITIN,NBITEX,IPASS
C INITIALIZE ARRAYS.
DO 100 I=1,NN
  ICC(I)=0
  IC(I)=0
100 CONTINUE
  NC=0
  ICC(1)=1
C CHECK IF IC IS COMPLETE.
105 DO 110 I=1,NN
  IF(IC(I)) 110,120,110
110 COMPNT=NC
  RETURN
120 NC=NC+1
  KI=0
  KO=1
  IW(I)=I
  IC(I)=NC
  IF(NC-1)130,125,125
125  IS=ICC(NC)+1
  ICC(NC+1)=IS
130  KI=KI+1
  II=IW(KI)
  N=IDEGL(II)
  IF(N)140,105,140
140  DO 200 I=1,N
    IA=IUNPK(IG,MAXGRD*(I-1)+II,NBITIN)
    IF(IC(IA)) 200,150,200
    IC(IA)=NC
200  CONTINUE
    IF(KO-KI)105,105,130
  END
  FUNCTION MAXDGR(NC,IC,IDEGL)
C THIS FUNCTION HAS AS ITS VALUE THE MAXIMUM DEGREE OF ANY NODE OF
C COMPONENT NC IF NC.GT.0
C IF NC.LE.0, ALL COMPONENTS ARE CONSIDERED.
  DIMENSION IC(1),IDEGL(1)
  COMMON /SA/ NN,MM,IH,IB
  M=0
  DO 100 I=1,NN
    IF(NC)40,50,40
    40  IF(IC(I)-NC) 100,50,100
    50  IF(IDEGL(I)-M) 100,100,60
    60  M=IDEGL(I)
100  CONTINUE
  MAXDGR=M
  RETURN
  END
  FUNCTION MAXBND(NC,IG,III,IC,IDEGL,NEW,ILD)
C THIS FUNCTION HAS AS ITS VALUE THE MAXIMUM DIFFERENCE BETWEEN NODE
C LABELS OF CONNECTED NODES FOR NODES OF COMPONENT NC.GT.0
C IF NC.LE.0, ALL COMPONENTS ARE CONSIDERED.
C THE NODAL RENUMBERING DEFINED BY ILD AND NEW MUST BE SET UP PRIOR
C TO THE FUNCTION CALL.
C COMPUTE IH, THE SUM CRIT (PROFILE).
  DIMENSION IG(III,1),IC(1),IDEGL(1),NEW(1),ILD(1)
  COMMON /SA/ NN,MM,IH,IB
  COMMON /A/ MAXGRD
  COMMON /BITS/ NBITIN,NBITEX,IPASS
  IH=0
  M=0
  DO 100 I=1,NN
    MX=0
    IA=NEW(I)
    IF(NC)40,50,40
    40  IF(IA.EQ.0)GO TO 100
    50  IF(NC-IC(IA)) 100,50,100
    N=IDEGL(IA)
    IF(N)100,100,150
150  DO 90 J=1,N
    II=IUNPK(IG,MAXGRD*(J-1)+IA,NBITIN)
    IB=MAXO(0,I-ILD(II))
    IF(IB.GT.MX) MX=IB
    90  CONTINUE
    IF(MX.GT.M) M=MX
    IH=IH+MX
100  CONTINUE
  MAXBND=M
  RETURN
  END
  FUNCTION MINDEG(NC,IC,IDEGL)
C THIS FUNCTION HAS AS ITS VALUE THE MINIMUM DEGREE OF ANY NODE OF
C COMPONENT NC IF NC.GT.0
C IF NC.LE.0, ALL COMPONENTS ARE CONSIDERED.
  DIMENSION IC(1),IDEGL(1)
  COMMON /SA/ NN,MM,IH,IB
  M=10000
  DO 100 I=1,NN
    IF(NC)40,50,40
    40  IF(IC(I)-NC) 100,50,100
    50  IF(M-IDEGL(I)) 100,100,60
    60  M=IDEGL(I)
100  CONTINUE
  MINDEG=M
  RETURN

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END
SUBROUTINE DIAM(NC,MAXDEG,NL,NODESL,MAXLEV,
+ IC,III,IC,IDEQ,DIS,IW,ICC)
C DETERMINE NL STARTING POINTS AND STORE IN NODESL.
DIMENSION IG(III,1),DIS(1),IW(1),ICC(1),IC(1),IDEQ(1)
COMMON /S/ NN,MM,IH,IB
COMMON /A/ MAXRD
COMMON /BITS/ NBITIN,NBITEX,IPASS
DIMENSION NODESL(1)
NL=0
MAXLEV=10000
DO 100 I=1,NN
IF(NC-IC(I)) 100,40,100
40 IF(MAXDEG-IDEQ(I)) 100,105,105
105 MD=IDIST(I,ML,MAXLEV,IG,III,IC,IDEQ,DIS,IW,ICC)
IF(MD) 115,115,56
56 IF(ML-MAXLFV) 58,64,100
58 MAXLEV=ML
NL=1
NODESL(1)=I
GO TO 100
64 IF(NL.GE.100) GO TO 100
NL=NL+1
NODESL(NL)=I
100 CONTINUE
110 RETURN
115 ML=1
NODESL(1)=I
MAXLEV=0
RETURN
END
SUBROUTINE RELABL(NS,NODES,IG,III,IC,IDEQ,DIS,IW,NEW,ICC,ILD)
C GENERATE A RELABELING SCHEME STARTING WITH NS NODES FOR WHICH
C   LABELS HAVE BEEN STORED IN ARRAY NODES.
C SET UP ILD AND NEW.
C ILD(OLD)=NEW
C   NEW(NEW)=OLD, THE INVERSE OF ILD
DIMENSION IG(III,1),IC(1),IDEQ(1),DIS(1),IW(1),NEW(1),ICC(1)
DIMENSION ILD(1)
COMMON /S/ NN,MM,IH,IB
INTEGER X
COMMON /A/ MAXRD
COMMON /BITS/ NBITIN,NBITEX,IPASS
DIMENSION NODES( 1),IAJ(50)
I=NODES(1)
ICN=IC(I)
NT=ICC(ICN)-1
DO 50 I=1,NN
IF(IC(I)-ICN) 50,40,50
40 IDIS(I)=0
50 CONTINUE
DO 100 J=1,NS
JJ=NODES(J)
DIS(JJ)=-1
JT=J+NT
NEW(JT)=JJ
100 ILD(JJ)=JT
KI=NT
KO=NS+NT
LL=KO
L=1
J=KO
NNC=ICC(ICN+1)-1
130 KI=KI+1
IF(KI-LL) 135,132,135
132 L=L+1
LL=KO+1
II=NEW(KI)
N=IDEQ(II)
IF(N) 140,255,140
140 IJ=0
DO 200 I=1,N
IA=IUNPK(IG,MAXRD*(I-1)+II,NBITIN)
IF(IDIS(IA)) 200,150,200
150 IJ=IJ+1
IDIS(IA)=L
KO=KO+1
IAJ(IJ)=IA
IH(IJ)=IDEQ(IA)
200 CONTINUE
IF(IJ-1) 250,210,220
210 J=KO
IZ=IAJ(1)
NEW(KO)=IZ
ILD(IZ)=KO
GO TO 250
220 X=0
221 DO 230 I=2,IJ
IF(IW(I)-IW(I-1)) 224,230,230
224 CONTINUE
X=IW(I)
IW(I)=IW(I-1)
IW(I-1)=X
225 X=IAJ(I)
IAJ(I)=IAJ(I-1)
IAJ(I-1)=X
230 CONTINUE
IF(X) 235,235,220
235 DO 240 I=1,IJ
J=J+1
MINDEG17      1801
DIAM 2          1802
DIAM 3          1803
DIAM 4          1804
DIAM 5          1805
DIAM 6          1806
DIAM 7          1807
DIAM 8          1808
DIAM 9          1809
DIAM 10         1810
DIAM 11         1811
DIAM 12         1812
DIAM 13         1813
DIAM 14         1814
DIAM 15         1815
DIAM 16         1816
DIAM 17         1817
DIAM 18         1818
DIAM 19         1819
DIAM 20         1820
DIAM 21         1821
DIAM 22         1822
DIAM 23         1823
DIAM 24         1824
DIAM 25         1825
DIAM 26         1826
DIAM 27         1827
DIAM 28         1828
DIAM 29         1829
DIAM 30         1830
DIAM 31         1831
RELABL 2        1832
RELABL 3        1833
RELABL 4        1834
RELABL 5        1835
RELABL 6        1836
RELABL 7        1837
RELABL 8        1838
RELABL 9        1839
RELABL10       1840
RELABL11       1841
RELABL12       1842
RELABL13       1843
RELABL14       1844
RELABL15       1845
RELABL16       1846
RELABL17       1847
RELABL18       1848
RELABL19       1849
RELABL20       1850
RELABL21       1851
RELABL22       1852
RELABL23       1853
RELABL24       1854
RELABL25       1855
RELABL26       1856
RELABL27       1857
RELABL28       1858
RELABL29       1859
RELABL30       1860
RELABL31       1861
RELABL32       1862
RELABL33       1863
RELABL34       1864
RELABL35       1865
RELABL36       1866
RELABL37       1867
RELABL38       1868
RELABL39       1869
RELABL40       1870
RELABL41       1871
RELABL42       1872
RELABL43       1873
RELABL44       1874
RELABL45       1875
RELABL46       1876
RELABL47       1877
RELABL48       1878
RELABL49       1879
RELABL50       1880
RELABL51       1881
RELABL52       1882
RELABL53       1883
RELABL54       1884
RELABL55       1885
RELABL56       1886
RELABL57       1887
RELABL58       1888
RELABL59       1889
RELABL60       1890
RELABL61       1891
RELABL62       1892
RELABL63       1893
RELABL64       1894
RELABL65       1895
RELABL66       1896
RELABL67       1897
RELABL68       1898
RELABL69       1899
RELABL70       1900

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        IZ=IAJ(I)
        NEW(J)=IZ
        ILD(IZ)=J
240    CONTINUE
250    IF(KO-NNC)130,255,255
255    CONTINUE
        RETURN
        END
        FUNCTION IDIST(NS,ML,MAXLEV,IG,III,IC,IDEF,DIS,IW,ICC)
C THIS FUNCTION HAS AS ITS VALUE THE MAXIMUM DISTANCE OF ANY NODE
C IN COMPONENT IC(NS) FROM THE NODE NS.
C THE DISTANCE OF EACH NODE IN THIS COMPONENT IS STORED IN THE ARRAY
C           DIS.
C THE MAXIMUM NUMBER OF NODES AT THE SAME DISTANCE FROM NS IS
C           STORED IN ML.
        DIMENSION IDIS(1),IC(1),IDEF(1),DIS(1),IW(1),ICC(1)
        COMMON /S/ NN,MM,IH,IB
        COMMON /A/ MAXGRD
        COMMON /BITS/ NBITIN,NBITEX,IPASS
        ICN=IC(NS)
        NNC=ICC(ICN+1)-ICC(ICN)
        DO 50 I=1,NN
        IF(IC(I)-IC(NS)) 50,40,50
40    IDIS(I)=0
        50 CONTINUE
        LL=1
        L=0
        KI=0
        KO=1
        ML=0
        IW(1)=NS
        IDIS(NS)=-1
130    KI=KI+1
        IF(KI-LL)135,132,135
132    L=L+1
        LL=KO+1
        K=KO-KI+1
        IF(K-ML) 135,135,133
133    ML=K
        IF(ML-MAXLEV) 135,135,220
135    II=IW(KI)
        N=IDEF(II)
        IF(N)140,215,140
140    DO 200 I=1,N
        IA=IUNPK(IG,MAXGRD*(I-1)+II,NBITIN)
        IF(IDIS(IA)200,150,200
150    IDIS(IA)=L
        KO=KO+1
        IW(KO)=IA
200    CONTINUE
        IF(KO-NNC)130,205,205
205    IDIST=L
        IDIS(NS)=0
        K=KO-KI
        IF(K-ML) 206,206,207
207    ML=K
206    CONTINUE
        RETURN
215    L=0
        GO TO 205
220    IDIST=1
        RETURN
        END
        IDENT PCUP
        LIST D,M,A
        ENTRY PACK,IPACK,UNPK,IUNPK,ABT
        EXT CPC
        USE /BITS/
        BSS 2
        IPASS BSS 1
        USE 0
        SIXTY DATA 60.
        PACK BSSZ 1
        IPACK EQU PACK
* SET FLAG TO INDICATE A PACK INSTRUCTION REQUIRED
        SB1 1
* LOAD A0 WITH THE ADDRESS OF THE ARGUMENT LIST
        INIT SB7 A0
        SA0 A1
* INCREASE ITERATION INDEX BY ONE
        SA5 IPASS
        SX6 1
        IX6 X5+X6
        SA6 A5+B0
* LOAD X6 WITH THE ADDRESS OF ARGUMENT LIST FOR LATER LOADING OF
* PACKED WORD
        BX6 X1
* LOAD X1 WITH THE SUBSCRIPT OF THE ARR1Y
        SA1 A0+1
        SA1 X1
* CONVERT SUBSCRIPT FROM INTEGER TO REAL
        PX1 B0,X1
        NX1 X1
* LOAD X2 WITH THE NUMBER OF BITS PER WORD
        SA2 SIXTY
* LOAD X3 WITH THE NUMBER OF BITS TO BE DEVOTED TO EACH PACKED WORD
        SA3 A0+2
        SA3 X3
* LOAD B6 WITH THE NUMBER OF BITS IN WORD NOT DEVOTED TO THE PACKED
* WORD
        PCUP 2 1964
        PCUP 3 1965
        PCUP 4 1966
        PCUP 5 1967
        PCUP 6 1968
        PCUP 7 1969
        PCUP 8 1970
        PCUP 9 1971
        PCUP 10 1972
        PCUP 11 1973
        PCUP 12 1974
        PCUP 13 1975
        PCUP 14 1976
        PCUP 15 1977
        PCUP 16 1978
        PCUP 17 1979
        PCUP 18 1980
        PCUP 19 1981
        PCUP 20 1982
        PCUP 21 1983
        PCUP 22 1984
        PCUP 23 1985
        PCUP 24 1986
        PCUP 25 1987
        PCUP 26 1988
        PCUP 27 1989
        PCUP 28 1990
        PCUP 29 1991
        PCUP 30 1992
        PCUP 31 1993
        PCUP 32 1994
        PCUP 33 1995
        PCUP 34 1996
        PCUP 35 1997
        PCUP 36 1998
        PCUP 37 1999
        PCUP 38 2000
        RELABL71 1901
        RELABL72 1902
        RELABL73 1903
        RELABL74 1904
        RELABL75 1905
        RELABL76 1906
        RELABL77 1907
        RELABL78 1908
        IDIST 2 1909
        IDIST 3 1910
        IDIST 4 1911
        IDIST 5 1912
        IDIST 6 1913
        IDIST 7 1914
        IDIST 8 1915
        IDIST 9 1916
        IDIST 10 1917
        IDIST 11 1918
        IDIST 12 1919
        IDIST 13 1920
        IDIST 14 1921
        IDIST 15 1922
        IDIST 16 1923
        IDIST 17 1924
        IDIST 18 1925
        IDIST 19 1926
        IDIST 20 1927
        IDIST 21 1928
        IDIST 22 1929
        IDIST 23 1930
        IDIST 24 1931
        IDIST 25 1932
        IDIST 26 1933
        IDIST 27 1934
        IDIST 28 1935
        IDIST 29 1936
        IDIST 30 1937
        IDIST 31 1938
        IDIST 32 1939
        IDIST 33 1940
        IDIST 34 1941
        IDIST 35 1942
        IDIST 36 1943
        IDIST 37 1944
        IDIST 38 1945
        IDIST 39 1946
        IDIST 40 1947
        IDIST 41 1948
        IDIST 42 1949
        IDIST 43 1950
        IDIST 44 1951
        IDIST 45 1952
        IDIST 46 1953
        IDIST 47 1954
        IDIST 48 1955
        IDIST 49 1956
        IDIST 50 1957
        IDIST 51 1958
        IDIST 52 1959
        IDIST 53 1960
        IDIST 54 1961
        IDIST 55 1962
        IDIST 56 1963
        PCUP 2 1964
        PCUP 3 1965
        PCUP 4 1966
        PCUP 5 1967
        PCUP 6 1968
        PCUP 7 1969
        PCUP 8 1970
        PCUP 9 1971
        PCUP 10 1972
        PCUP 11 1973
        PCUP 12 1974
        PCUP 13 1975
        PCUP 14 1976
        PCUP 15 1977
        PCUP 16 1978
        PCUP 17 1979
        PCUP 18 1980
        PCUP 19 1981
        PCUP 20 1982
        PCUP 21 1983
        PCUP 22 1984
        PCUP 23 1985
        PCUP 24 1986
        PCUP 25 1987
        PCUP 26 1988
        PCUP 27 1989
        PCUP 28 1990
        PCUP 29 1991
        PCUP 30 1992
        PCUP 31 1993
        PCUP 32 1994
        PCUP 33 1995
        PCUP 34 1996
        PCUP 35 1997
        PCUP 36 1998
        PCUP 37 1999
        PCUP 38 2000

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SB6	X3-60		PCUP	39	2001
SB6	-B6		PCUP	40	2002
* CONVERT THE NUMBER OF BITS PER PACKED WORD FROM INTEGER TO REAL			PCUP	41	2003
PX3	B0,X3		PCUP	42	2004
NX3	X3		PCUP	43	2005
* LOAD X2 WITH THE NUMBER OF PACKED WORDS THAT CAN EXIST PER 60 BIT WORD			PCUP	44	2006
FX2	X2/X3		PCUP	45	2007
* TRUNCATE X2 TO LOSE ANY FRACTIONAL PART			PCUP	46	2008
UX2	B2,X2		PCUP	47	2009
LX2	B2,X2		PCUP	48	2010
PX2	B0,X2		PCUP	49	2011
NX2	X2		PCUP	50	2012
* LOAD X5 WITH THE NUMBER OF 60 BIT WORDS NECESSARY TO LOCATE THE POSITION IN ABSOLUTE CORE THAT THE VARIABLE ADDRESSED			PCUP	51	2013
FX5	X1/X2		PCUP	52	2014
* CONVERT X5 TO INTEGER BRIEFLY FOR AN INTEGER ADD OPERATION			PCUP	53	2015
UX5	B2,X5		PCUP	54	2016
LX5	B2,X5		PCUP	55	2017
* X6 NOW POINTS TO THE ABSOLUTE LOCATION IN CORE CONTAINING THE VARIABLE DESIRED			PCUP	56	2018
IX6	X5+X6		PCUP	57	2019
PX5	B0,X5		PCUP	58	2020
NX5	X5		PCUP	59	2021
* LOAD X4 WITH THE NUMBER OF WHOLE 60 BIT WORDS TO FIND THE LOCATION DESIRED			PCUP	60	2022
FX4	X2*X5		PCUP	61	2023
* X4 NOW CONTAINS OFFSET WITHIN THE LOCATION FOR PACKED VALUE			PCUP	62	2024
FX4	X1-X4		PCUP	63	2025
NX4	X4		PCUP	64	2026
* CONVERT X4 TO INTEGER BRIEFLY FOR COMPARISON PURPOSES			PCUP	65	2027
UX4	B2,X4		PCUP	66	2028
LX4	B2,X4		PCUP	67	2029
* SET X6 TO ITSELF - 1 FOR A ZERO X4 VALUE			PCUP	68	2030
* X4 = 0 INDICATES THAT THE PACKED VARIABLE ENDS ON A WORD BOUNDARY			PCUP	69	2031
NZ	X4,BR		PCUP	70	2032
SX6	X6-1		PCUP	71	2033
* LOAD X1 WITH THE NUMBER OF BITS TO BE SHIFTED			PCUP	72	2034
BR	PX4	B0,X4	PCUP	73	2035
	NX4	X4	PCUP	74	2036
	FX1	X3*X4	PCUP	75	2037
* CONVERT X1 TO INTEGER AND SAVE IN B2 FOR LATER USE			PCUP	76	2038
UX1	B2,X1		PCUP	77	2039
LX1	B2,X1		PCUP	78	2040
SB2	X1		PCUP	79	2041
* LOAD THE VARIABLE OF CORE CONCERNED			PCUP	80	2042
SA2	X6		PCUP	81	2043
* SHIFT THE WORD TO ALIGN PROPERLY FOR MASK			PCUP	82	2044
LX2	B2,X2		PCUP	83	2045
* COMPLEMENT B2			PCUP	84	2046
SB2	-B2		PCUP	85	2047
* FORM A 59 BIT MASK IN THE LOWER 59 BITS OF X4			PCUP	86	2048
MX4	59		PCUP	87	2049
LX4	59		PCUP	88	2050
* B2 NOW HAS THE NUMBER OF BITS PER PACKED WORD			PCUP	89	2051
SB2	B2+60		PCUP	90	2052
* LOAD X4 WITH A MASK OF 1'S WHOSE LENGTH EQUALS THE THIRD ARGUMENT - 1			PCUP	91	2053
AX4	B6,X4		PCUP	92	2054
SX5	1		PCUP	93	2055
* X6 HAS A MASK FOR SIGN AND VALUE			PCUP	94	2056
IX5	X4+X5		PCUP	95	2057
IX6	X4+X5		PCUP	96	2058
* +0 TO UPK IF AN UNPACK IS DESIRED			PCUP	97	2059
EQ	B1,UPK		PCUP	98	2060
* LOAD X1 WITH THE VALUE TO BE LOADED INTO CORE			PCUP	99	2061
SA1	A0+3		PCUP	100	2062
SA1	X1		PCUP	101	2063
* INSURE THAT VALUE IS NOT TOO LARGE FOR PROPER PACKING			PCUP	102	2064
BX0	X1		PCUP	103	2065
PL	X0,CHK		PCUP	104	2066
BX0	-X0		PCUP	105	2067
CHK	IX0	X0-X4	PCUP	106	2068
	PL	X0,DMP	PCUP	107	2069
* IF VALUE IS NEGATIVE, SET SIGN MASK TO ZERO			PCUP	108	2070
NG	X1,SCH		PCUP	109	2071
SX5	B0		PCUP	110	2072
* AND OUT THE VALUE TO BE PACKED INTO X1			PCUP	111	2073
SCH	BX1	X1*X4	PCUP	112	2074
* OR THE SIG5 INTO X1			PCUP	113	2075
	BX1	X1*X5	PCUP	114	2076
* COMPLEMENT X6			PCUP	115	2077
BX6	-X6		PCUP	116	2078
* ZERO OUT THE RITS INTO WHICH THE PACKED VALUE IS TO BE INSERTED			PCUP	117	2079
BX2	X2*X6		PCUP	118	2080
* OR THE PACKED VALUE INTO A 60 BIT WORD AT THE PROPER LOCATION			PCUP	119	2081
BX2	X1*X2		PCUP	120	2082
* SHIFT THE 60 BIT WORD TO REALIGN WITH CORE			PCUP	121	2083
LX6	B2,X2		PCUP	122	2084
* STORE THE 60 BIT PACKED WORD IN CORE			PCUP	123	2085
* THE FUNCTION RETURNS A 60 BIT PACKED VALUE			PCUP	124	2086
SA6	A2		PCUP	125	2087
* RESTORE A0			PCUP	126	2088
SA0	B7		PCUP	127	2089
* BRANCH OUT OF THE ROUTINE			PCUP	128	2090
ZR	PACK		PCUP	129	2091
UNPK	BSSZ	1	PCUP	130	2092
IUNPK	EQU	UNPK	PCUP	131	2093
* SET FLAG TO INDICATE AN UNPACK INSTRUCTION IS DESIRED			PCUP	132	2094
SB1	B0		PCUP	133	2095
ZR	INIT		PCUP	134	2096
			PCUP	135	2097
			PCUP	136	2098
			PCUP	137	2099
			PCUP	138	2100

* OR THE 60 BIT WORD OF CORE TO REMOVE 1 PACKED VALUE INTO X6	PCUP 139	2101
UPK BX6 X2*X4	PCUP 140	2102
* OR A 60 BIT WORD TO REMOVE SIGN OF PACKED WORD INTO X5	PCUP 141	2103
BX5 X5*X2	PCUP 142	2104
* COMPLEMENT VALUE IF SIGN MASK INDICATES A NEGATIVE VALUE	PCUP 143	2105
ZR X5,SC	PCUP 144	2106
BX4 -X4	PCUP 145	2107
BX6 X4+X6	PCUP 146	2108
* RESTORE A0	PCUP 147	2109
SC SA0 B7	PCUP 148	2110
* BRANCH OUT OF THE ROUTINE	PCUP 149	2111
ZR UNPK	PCUP 150	2112
* GENERATE A DAYFILE MESSAGE AND ABORT JOB IF AN INTEGER TO BE	PCUP 151	2113
PACKED IS TOO LARGE FOR THE SPECIFIED BIT PATTERN	PCUP 152	2114
PKMSS DATA C*VALUE TOO LARGE TO PACK*	PCUP 153	2115
DMP MESSAGE PKMSS,,1	PCUP 154	2116
AB ABORT	PCUP 155	2117
* ENTRY POINT TO ABORT JOB AND EXECUTE EXIT CONTROL CARDS.	PCUP 156	2118
ABT DATA 0	PCUP 157	2119
EQ AB	PCUP 158	2120
END	PCUP 159	2121
IDENT CORS	CORS 2	2122
ENTRY CORSIZ	CORS 3	2123
VFD 36/6HCORSIZ,24/0	CORS 4	2124
USE //	CORS 5	2125
A BSS 1	CORS 6	2126
USE /K/	CORS 7	2127
BSS 7	CORS 8	2128
KORE BSS 1	CORS 9	2129
CM BSS 1	CORS 10	2130
USE 0	CORS 11	2131
CORSIZ DATA 0	CORS 12	2132
MEMORY CM,STATUS,1	CORS 13	2133
SX0 1B	CORS 14	2134
SA3 STATUS	CORS 15	2135
IX6 X3-X0	CORS 16	2136
LX6 30	CORS 17	2137
SA6 CM	CORS 18	2138
SX5 A	CORS 19	2139
IX6 X6-X5	CORS 20	2140
SA6 KORE	CORS 21	2141
EQ CORSIZ	CORS 22	2142
STATUS DATA 0	CORS 23	2143
END	CORS 24	2144

APPENDIX B
LISTING OF THE MACHINE-INDEPENDENT VERSION OF BANDIT

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C          B A N D I T
C
C MAIN PROGRAM FOR THE RENUMBERING OF NASTRAN GRID POINTS FOR
C REDUCED BANDWIDTH.
C THE NASTRAN DATA DECK MUST CONTAIN A BEGIN BULK CARD IN ITS
C PROPER PLACE AND TERMINATE WITH AN ENDATA CARD.
DIMENSION A(20)
COMMON /KOM/25000)
COMMON /S/ NN,MM,IH,IB
COMMON /P/ IH0,IHE
COMMON /A/ MAXGRD,MAXDEG,KMOD,NMPC
COMMON /B/ IPARAM(20),IARG(5)
COMMON /C/ IWARN,LINE,KORIG,KNEW
COMMON /K/ II(7),KURE,IFL
COMMON /BITS/ NBITIN,NBITEX,IPASS
COMMON /TIME/ STIME,NCOMP
COMMON /NEL/ NEL,TIM2
COMMON /JUL/ ISTART(100),IGNORE(100),IFIRST(100)
COMMON /DULL/ IUIM,ISTA,IIG,IFIR,IGDEG,ISCH
COMMON /ZERO/ KT
COMMON /NG/ NGRID,CLOCK
INTEGER EOF
DATA BEGI,ENDJ,SEQG/4HDEGI,4HENOD,4HSE4G/
C SET NGRID DEFAULT.
KORE=25000
NGRID = KORE/28
C SET SCHEME DEFAULTS.
IARG(1)=30
IARG(2)=1
IARG(3)=2
IARG(4)=2
IARG(5)=0
C SET NUMBER OF BITS PER WORD FOR INTERNAL AND EXTERNAL
C      GRID NUMBERS.
NBITIN=12
NBITEX=60
7 FORMAT(1$1,18(/),
1 36X,57H000000,      AAAAAA   N   N  JDDDDDD  IIIIIII  TTTTTTTT/BANDIT49 39
2 36X,57H3     0   A   A   NN   N   J   0   I   T   /BANDIT50 40
3 36X,57H1     0   A   A   A   N   N   N   0   0   I   T   /BANDIT51 41
4 36X,57HddBddB,      A   A   A   N   N   N   0   0   I   T   /BANDIT52 42
5 36X,57H3     0   AAAAAAA   N   N   N   J   0   I   T   /BANDIT53 43
6 36X,57H3     0   A   A   A   N   N   N   0   0   I   T   /BANDIT54 44
7 36X,57HddBddB,      A   A   A   N   N   N   0   0   0   I   T   /BANDIT55 45
8 FORMAT(22/,48x,34HTHEORY OF STRUCTURES BRANCH - 1844 /
1 46X,3dHCOMPUTATION AND MATHEMATICS DEPARTMENT /
2 44X,+2HNATIONAL NAVAL SHIP RESEARCH AND DEVELOPMENT CENTER /
3 53X,24HBTHESUA, MARYLAND 20034 )
9 FORMAT(57X,
+ 16HREV. 10 MAR 1972 )
10 FORMAT(20A4)
11 FORMAT(14 ,20A4)
12 FORMAT(1$1)
13 FORMAT(//26H TOTAL CP TIME IN BANDIT ,F9.3,6H SEC.)
LINE=55
KNEW=0
REWIND 8
C PRINT TITLE PAGE.
WRITE(6,7)
WRITE(6,8)
WRITE(6,9)
C INITIALIZE VARIABLES.
DO 15 J=1,20
 15 IPARAM(J)=0
  IPARAM(12)=4
  IDIM=100
  ISTA=0
  II0=0
  ISCH=0
  IFIR=0
  IGDEG=0
  DO 18 I=1,10I4
    ISTART(I)=0
    IFIRST(I)=0
  18 IGNORE(I)=0
  IPASS=0
  NN=0
  MM=0
  MAXGRD=0
  MAXDEG=0
  KMOD=0
  KORIG=0
  KNEW=0
  STIME=0.
  NCMP=0
  NEL=0
  KT=0
  TIM2=0.
  REWIND 9
C READ DECK FOR FIRST TIME.
CALL GOOGAN(1,2,5,9)
C SLICE UP CORE ACCORDING TO SUBROUTINE GRID.
K2=II(1)*II(2)+1
K3=K2+II(3)*2
K4=K3+II(4)
K5=K4+II(5)
K6=K5+II(6)
K7=K6+II(7)
C PROCESS DECK.

```

BANDIT 5	1
BANDIT 6	2
BANDIT 7	3
BANDIT 8	4
BANDIT 9	5
BANDIT10	6
BANDIT11	7
BANDIT12	8
JJ 1	9
BANDIT14	10
BANDIT15	11
BANDIT16	12
BANDIT17	13
BANDIT18	14
BANDIT19	15
BANDIT20	16
BANDIT21	17
BANDIT22	18
BANDIT23	19
BANDIT24	20
BANDIT25	21
BANDIT26	22
BANDIT27	23
BANDIT28	24
BANDIT35	25
JJ 2	26
JJ 3	27
BANDIT38	28
BANDIT39	29
BANDIT40	30
BANDIT41	31
BANDIT42	32
BANDIT43	33
BANDIT44	34
BANDIT45	35
BANDIT46	36
BANDIT47	37
BANDIT48	38
JJ 4	39
BANDIT50	40
BANDIT51	41
BANDIT52	42
BANDIT53	43
BANDIT54	44
BANDIT55	45
JJ 5	46
BANDIT57	47
BANDIT58	48
BANDIT59	49
BANDIT61	50
BANDIT62	51
BANDIT63	52
BANDIT64	53
JJ 6	54
BANDIT66	55
BANDIT67	56
BANDIT68	57
BANDIT69	58
BANDIT70	59
BANDIT71	60
BANDIT72	61
BANDIT73	62
BANDIT74	63
BANDIT75	64
BANDIT76	65
BANDIT77	66
BANDIT78	67
BANDIT79	68
BANDIT80	69
BANDIT81	70
BANDIT82	71
BANDIT83	72
BANDIT84	73
BANDIT85	74
BANDIT86	75
BANDIT87	76
BANDIT88	77
BANDIT89	78
BANDIT90	79
BANDIT91	80
BANDIT92	81
BANDIT93	82
BANDIT94	83
BANDIT95	84
BANDIT96	85
BANDIT97	86
BANDIT98	87
BANDIT99	88
BANDIJJ	89
BANDI101	90
BANDI102	91
BANDIJJ	92
BANDIJJ	93
BANDI104	94
BANDI105	95
BANDI106	96
BANDI107	97
BANDI108	98
BANDI109	99
BANDI11J	100

```

CALL NASNUM(KOM(1),II(1),KOM(K2),II(3),KOM(K3),KOM(K4),KOM(K5),
+ KOM(K6),KOM(K7),KOM(1),KOM(K2))
C ARRAY STARTING AT LOCATION K7 HAS DIMENSION 2*MAXDEG
C PROCESS OUTPUT ACCORDING TO OUTPUT REQUESTS.
C CHECK IF CONNECTION CARDS IN DECK.
    IF(IPARAM(9).EQ.3)GO TO 19
    REWIND 8
    REWIND 9
    FLAG=ENDO
    J=0
    K=9
    GO TO 20
19 REWIND 8
    J=0
    K=8
    FLAG=ENDO
    IF(IPARAM(5).EQ.4)GO TO 20
    K=9
    IF(IPARAM(6).EQ.3)FLAG=BEGI
20 REAO(K,10)A
    IF(EOF(K).NE.0)CALL BOMBIT(1)
    J=J+1
    IF(IPARAM(10).EQ.5.AND.A(1).NE.SEQG) J=J-1
    IF(MOJ(J,LINE).EQ.1)WRITE(6,12)
    IF(IPARAM(10).EQ.6) WRITE(6,11) A
    IF(IPAKA(110).EQ.5.AND.A(1).EQ.SEQG) WRITE(6,11) A
    IF(IPARAM(1).EQ.2)WRITE(7,10)A
    IF(IPARAM(1).EQ.1.AND.A(1).EQ.SEQG) WRITE(7,10) A
    IF(K.NE.3) WRITE(8,10) A
    IF(A(1).NE.FLAG)GO TO 20
    IF(FLAG.EQ.ENDO)GO TO 25
    FLAG=ENDO
    K=5
    GO TO 20
25 CONTINUE
    IF(IPARAM(5).EQ.3)GO TO 60
    IF(IPARAM(7).EQ.4)GO TO 60
    IF(IPARAM(9).EQ.4)GO TO 60
C USER SUMMARY.
    WRITE(6,50) KORIG,KNEW
50 FORMAT(23H1***BANDIT USER SUMMARY /
1 8X,2SHORIGINAL SEMI-BANDWIDTH ,I9/
2 8X,2DHNEW SEMI-BANDWIDTH ,I14)
    WRITE(6,117) IH0,IHE
117 FORMAT(8X,18HORIGINAL PROFILE ,I16/8X,13HNEW PROFILE ,I21)
    WRITE(6,104) NN
    WRITE(6,115) NEL
    WRITE(6,112) NCOMP
    WRITE(6,107) 4M
107 FORMAT(8X,22HMAXIMUM NODEAL DEGREE ,I12)
    WRITE(6,116) KT
    I=IPARAM(1)
    IF(I.EQ.1) WRITE(6,101)
    IF(I.EQ.2) WRITE(6,102)
    IF(I.EQ.3) WRITE(6,103)
101 FORMAT(8X,34HPUNCH OUTPUT           SEQGP CARDS )
102 FORMAT(8X,34HPUNCH OUTPUT          ALL CARDS )
103 FORMAT(8X,34HPUNCH OUTPUT          NONE )
    WRITE(6,105) MAXGRU,MAXDEG
105 FORMAT(18X,8HMAXGRU ,I11/18X,8HMAXDEG ,I11)
111 FORMAT(8X,14HDATE AND TIME ,2A10)
C IPASS=NUMBER OF PUPUP CALLS.
104 FORMAT(8X,23HNUMBER OF GRID POINTS ,I11)
113 FORMAT(8X,23HNUMBER OF ELEMENTS ,I14)
112 FORMAT(8X,22HNUMBER OF COMPONENTS ,I12)
115 FORMAT(8X,23HNO. OF POINTS OF ZERO DEGREE ,I6)
    GO TO 70
6J IF(IPARAM(10).EQ.5) WRITE(6,12)
70 CONTINUE
    REWIND 8
    IF(IPARAM(8).EQ.4) STOP 5
    STOP
    END
    SUBROUTINE NASNUM(IG,II1,INV,II3,INT,ICC,ILD,NORIG,IP,JU,JNV)
    DIMENSION A(8),KU(40),LG(40),LINE(10),J(20),ATEMP(4)
    DIMENSION IG(II1,1),INV(II3,2),JG(1),JNV(1)
    DIMENSION INT(1),ICC(1),ILU(1),NORIG(1),IP(1)
    C IP HAS DIMENSION 2*MAXDEG. JG AND JNV ARE EQUIV TO IG AND INV.
    COMMON /S/ NN,MH,II,B
    COMMON /A/ MAXGRU,MAXDEG,KMOU,NMPC
    COMMON /B/ IPARAM(20),IARG(5)
    COMMON /C/ IWARN,NLINE,KORIG,KNEW
    COMMON /D/ NUITIN,NUTEX,IPASS
    COMMON /E/ II(7),KOR
    COMMON /F/ TIME,TIM2,NCOMP
    COMMON /G/ NEL,NEL
    COMMON /JOL/ ISTART(100),IGNORE(100),IFIRST(100)
    COMMON /JOL/ IDIM,ISTA,II,G,IFIN,IGDEG,ISCH
C THE VARIABLE LINE DEFINED NEAR CARD NASNUM.300 IS NOT THE
C SAME AS THE VARIABLE LINE APPEARING IN COMMON
C IN OTHER ROUTINES.
    DIMENSION TYPE(50),YPE(50)
    DIMENSION F1A(2),F1A(2),F1B(2),F1B(2)
    DATA 3LGI,ENDO,SEQG/4H0EGI,4HENOD,4HSEQG/
    DATA TYPE/4HC03AX,4HCELA,4HCONK,4HLQDM,4HCQDP,4HCQJA,
1   4HCQUA,4HCQUA,4HGRD,4HCSHE,4HCTR,4HCTR,4HCTR,
2   4HCTR,4HCTR,4HCTWI,4HENJD,4HMPC*,4HCDAM,4HCJAM,4HCMAS,
3   4HCMAS,4HCVIS,4HCDAM,4HCELA,4HCELA,4HCMAS,4HCMAS,
4   4HCCON,4HCTRA,4HCTR,4HC04M,4HCNN,4HCHTT,4HCIS,
5   4HCIS3,4HCIS2,4HCIS2,4HCISH,4HCISH,4HCFLU,4HCFLU,4HCFLU,
BANDI111      101
BANDI112      102
BANDI113      103
BANDI114      104
BANDI115      105
BANDI116      106
BANDI117      107
BANDI118      108
BANDI119      109
BANDI120      110
BANDI121      111
BANDI122      112
BANDI123      113
BANDI124      114
BANDI125      115
BANDI126      116
BANDI127      117
BANDI128      118
BANDI129      119
BANDI130      120
BANDI131      121
BANDI132      122
BANDI133      123
BANDI134      124
BANDI135      125
BANDI136      126
BANDI137      127
BANDI138      128
BANDI139      129
BANDI140      130
BANDI141      131
BANDI142      132
BANDI143      133
BANDI144      134
JJ     7      135
BANDI147      136
BANDI148      137
BANDI149      138
BANDI150      139
JJ     8      140
BANDI152      141
JJ     9      142
JJ    10      143
BANDI156      144
JJ    11      145
BANDI158      146
BANDI159      147
BANDI160      148
BANDI161      149
JJ    12      150
BANDI163      151
BANDI164      152
BANDI165      153
BANDI166      154
BANDI167      155
BANDI168      156
BANDI169      157
BANDI170      158
BANDI172      159
JJ    13      160
BANDI177      161
BANDI178      162
JJ    14      163
JJ    15      164
JJ    16      165
JJ    17      166
BANDI184      167
BANDI185      168
BANDI187      169
BANDI188      170
BANDI190      171
BANDI191      172
BANDI192      173
NASNUM 2      174
NASNUM 3      175
NASNUM 4      176
NASNUM 5      177
NASNUM 6      178
NASNUM 7      179
NASNUM 8      180
NASNUM 9      181
NASNUM10      182
NASNUM11      183
NASNUM12      184
NASNUM13      185
NASNUM14      186
NASNUM15      187
NASNUM16      188
NASNUM17      189
NASNUM18      190
NASNUM19      191
NASNUM20      192
NASNUM21      193
NASNUM22      194
NASNUM23      195
NASNUM24      196
NASNUM25      197
NASNUM26      198
NASNUM27      199
NASNUM28      200

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b 4HCTET,4HCHEX,4HCHEX/
 DATA WYPE/4H*,4HS1*,4S2*,4H0D*,4HEM*,4HLT*,4H01*,  

1 4HJ2*,4HU3*,4H*,4HAR*,4HSC*,4HA1*,4HA2*,4HEM*,  

2 4HLT*,4HE*,4HST*,4HATA,4H*,4HP1*,4HP2*,4HS1*,  

3 4HS2*,4HU*,4HP3*,4HP4*,4HS3*,4HS4*,4HS3*,4HS4*,  

4 4HEAX*,4HORU*,4HPRG*,4HARG*,4H1*,4H2*,4HRI2*,4HD8*,  

5 4HD20*,4HD4*,4HD8*,4H8*,4H16*,4HID2*,4HID3*,4HID4*,  

6 4HRA*,4HA1*,4HA2*/  

NTYPE=50  

REWIND 8  

REWIND 9  

NMPC=40  

KMOU=2.*FLOAT(MAXGRD)-2.2715*SQRT(1.131*FLOAT(MAXGRD))  

NEW=0  

IWARN=0  

NEO=0  

2 FORMAT(29H1 BANDIT INFORMATION MESSAGE /  

+19H NO GRID POINTS/  

+28H RESEQUENCING SUPPRESSED)  

4 FORMAT( 19H ***NEW BANDWIDTH =,I6)  

5 FORMAT(35H THE WRONG CARD FOLLOW THIS CARD/1X,2A4,1P4E16.7,2A4//  

2 40H THE CONTINUATION CARD IS REQUIRED NEXT,  

3 3H SINCE BANJIT DOES NOT SORT THE DECK. /  

4 13H FATAL ERROR. )  

o FORMAT(1H1)  

7 FORMAT(5+1H ONE OR MORE SEQGP CARDS ALREADY APPEAR IN DATA DECK./  

+ 55H RESEQUENCING CANNOT BE REQUESTED. FATAL ERROR. )  

8 FORMAT(5+SEQGP,3X,8I8,8X)  

9 FORMAT(20A4).  

1J FORMAT(2A4,4F16.0,2A4)  

11 FORMAT(14 ,>(18,I11,7X))  

12 FORMAT(5HSEQGP,3X,8I8,8X)  

14 FORMAT(///26H ***BANDIT WARNING MESSAGE /  

1 11X,35H THE WRONG CARD MAY FOLLOW THIS CARD /  

2 11X,2A4,1P4E16.7,2A4/  

3 11X,7HCHEX INPUT DECK TO BE SURE THAT A CONTINUATION ,  

4 42H CARD IS NEITHER MISSING NOR OUT OF SORT. )  

15 FORMAT(26H TOTAL CP TIME IN SCHEME =,F9.3,6H SEC. )  

19 FORMAT(1H1,5(20H INTERNAL ORIGINAL,6X)/  

1H ,5(20H GRID NO. GRID PT.,6X))  

C RETURN IF RESEQUENCING IS NOT DESIRED.  

IF(IPARAM(5),EQ.3)RETURN  

C UHACK IF SEQGP CARDS ALREADY APPEAR IN DECK.  

IF(IPARA(17),EQ.3)GO TO 22  

C ABORT BANJIT SINCE SEQGP CARDS ALREADY APPEAR IN DECK.  

WRITE(6,7)  

CALL BOMBIT(3)  

C READ AND EXTRACT CONNECTION CARDS FROM DECK.  

22 CALL SOOGAN(2,1,9,8)  

REWIND 8  

REWIND 9  

C INITIALIZE EXPANDABLE CORE.  

DO 30 I=1,KORE  

30 JG(I)=0  

C READ CARD.  

40 READ(8,1)F1A,(A(I),I=1,4),F10A  

C DETERMINE CARD TYPE.  

45 ITYPE=0  

DO 50 I=1,NTYPE  

50 IF(F1A(1).EQ.TYPE(I).AND.F1A(2).EQ.WYPE(I)) ITYPE=I  

IF(ITYPE.EQ.0)GO TO 40  

IF(ITYPE.EQ.19)GO TO 500  

IF(ITYPE.EQ.20.AND.IPARAM(4).EQ.3)GO TO 40  

C READ CONTINUATION TO CARD JUST READ.  

READ(8,1)F1B,(A(I),I=5,8),F10B  

C CHECK EACH LOGICAL CARD FOR PROPER SORT.  

IF(F1B(1).EQ.F1A(1).AND.F1B(2).EQ.F1A(2)) GO TO 60  

C-- IF FOLLOWING CARD TYPES ARE OUT OF SORT, NO ERROR  

IF(ITYPE.EQ.1.OR.ITYPE.EQ.4)GO TO 56  

IF(ITYPE.EQ.32)GO TO 56  

IF(ITYPE.EQ.33)GO TO 56  

IF(ITYPE.EQ.35)GO TO 56  

IF(ITYPE.EQ.36)GO TO 56  

IF(ITYPE.EQ.37)GO TO 56  

IF(ITYPE.EQ.45.OR.ITYPE.EQ.46) GO TO 56  

C-- IF FOLLOWING CARD TYPES ARE OUT OF SORT, POSSIBLE ERROR (GIVE  

C--          WARNING MESSAGE)  

IWARN=IWARN+1  

IF(MOJIWARN,6).EQ.1)WRITE(6,6)  

IF(ITYPE.EQ. 2) GO TO 54  

IF(ITYPE.EQ. 3) GO TO 54  

IF(ITYPE.EQ.10) GO TO 54  

IF(ITYPE.EQ.17) GO TO 54  

IF(ITYPE.GE.21.AND.ITYPE.LE.31)GO TO 54  

C-- FOR OTHER CARD TYPES OUT OF SORT, ABORT BANDIT  

52 WRITE(6,5)F1A,(A(I),I=1,4),F10A  

CALL BOMBIT(2)  

54 WRITE(6,14)F1A,(A(I),I=1,4),F10A  

C SAVE CONTENTS OF THE SECOND CARD OF THE PAIR.  

56 DO 58 I=1,4  

ATEMP(I)=A(I+4)  

58 A(I+4)=0.  

C INITIALIZE KG AND LG.  

60 DO 70 I=1,NMPC  

KG(I)=0  

70 LG(I)=0  

LOOP=1  

NCON=4  

C SET UP KG AND LG. **  

GO TO (160,220,220,200,120,120,120,120,120,180,120,140,140,
NASNUM29 201
NASNUM30 202
NASNUM31 203
NASNUM32 204
NASNUM33 205
NASNUM34 206
NASNUM35 207
NASNUM36 208
NASNUM37 209
NASNUM38 210
NASNUM39 211
NASNUM40 212
NASNUM41 213
NASNUM42 214
NASNUM43 215
NASNUM44 216
NASNUM45 217
NASNUM46 218
NASNUM47 219
NASNUM48 220
NASNUM49 221
NASNUM50 222
NASNUM51 223
NASNUM52 224
NASNUM53 225
NASNUM54 226
NASNUM55 227
NASNUM56 228
NASNUM57 229
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NASNUM95 267
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NASNU100 272
NASNU101 273
NASNU102 274
NASNU103 275
NASNU104 276
NASNU105 277
NASNU106 278
NASNU107 279
NASNU108 280
NASNU109 281
NASNU110 282
NASNU111 283
NASNU112 284
NASNU113 285
NASNU114 286
NASNU115 287
NASNU116 288
NASNU117 289
NASNU118 290
NASNU119 291
NASNU120 292
NASNU121 293
NASNU122 294
NASNU123 295
NASNU124 296
NASNU125 297
NASNU126 298
NASNU127 299
NASNU128 300

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1      14J,1+J,140,180,12J,500,230,220,220,220,180,180,
2      18J,18J,180,18J,18J,160,160,110,114,118,118,140, 80,
3      85,120, 90, 80, 95,200,114,110,120, 90, 90),ITYPE
C* CIS3U8,CISH3          NASNU129   301
80 DO 81 I=1,7           NASNU130   302
81 KG(I)=A(I+1)+0.5     NASNU131   303
  NCON=3                 NASNU132   304
  READ(9,1J) F1A,A(1),A(2),A(3),A(4),F10A
  IF(F1A(1).NE.F1U3(1).OR.F1A(2).NE.F10B(2)) GO TO 100
  KG(8)=A(1)+0.5        NASNU133   305
  GO TO 250              NASNU134   306
C* CIS3D20          NASNU135   307
85 DO 86 I=1,7           NASNU136   308
86 KG(I)=A(I+1)+0.5     NASNU137   309
  NCON=20                NASNU138   310
  READ(8,1J) F1A,A(1),A(2),A(3),A(4),F10A
  IF(F1A(1).NE.F1U1(1).OR.F1A(2).NE.F10B(2)) GO TO 100
  READ(8,10) F1d,A(5),A(6),A(7),A(8),F10B
  IF(F18(1).NE.F1UA(1).OR.F1B(2).NE.F10A(2)) GO TO 52
  DO 87 I=8,15            NASNU141   313
  87 KG(I)=A(I-7)+0.5    NASNU142   314
  READ(8,1J) F1A,A(1),A(2),A(3),A(4),F10A
  IF(F1A(1).NE.F1U8(1).OR.F1A(2).NE.F10B(2)) GO TO 100
  READ(8,1J) F1d,A(5),A(6),A(7),A(8),F10B
  IF(F13(1).NE.F1UA(1).OR.F1B(2).NE.F10A(2)) GO TO 52
  DO 88 I=16,20            NASNU143   315
  88 KG(I)=A(I-15)+0.5   NASNU144   316
  GO TO 250              NASNU145   317
C* CIS2D8,C4EXA1,CHEXA2  NASNU146   318
9J DO 91 I=1,6           NASNU147   319
91 KG(I)=A(I+2)+0.5     NASNU148   320
  NCON=8                 NASNU149   321
  READ(3,10) F1A,A(1),A(2),A(3),A(4),F10A
  IF(F1A(1).NE.F10B(1).OR.F1A(2).NE.F10B(2)) GO TO 100
  DO 92 I=7,8            NASNU150   322
  92 KG(I)=A(I-6)+0.5    NASNU151   323
  GO TO 250              NASNU152   324
C* CIS16               NASNU153   325
93 DO 90 I=1,7           NASNU154   326
90 KG(I)=A(I+1)+0.5     NASNU155   327
  NCON=8                 NASNU156   328
  READ(3,1J) F1A,A(1),A(2),A(3),A(4),F10A
  IF(F1A(1).NE.F10B(1).OR.F1A(2).NE.F10B(2)) GO TO 100
  READ(3,1J) F1d,A(5),A(6),A(7),A(8),F10B
  IF(F13(1).NE.F10A(1).OR.F1B(2).NE.F10A(2)) GO TO 52
  DO 97 I=9,15            NASNU157   329
  97 KG(I)=A(I-7)+0.5    NASNU158   330
  READ(3,10) F1A,A(1),A(2),A(3),A(4),F10A
  IF(F1A(1).NE.F10B(1).OR.F1A(2).NE.F10B(2)) GO TO 100
  KG(16)=A(1)+0.5       NASNU159   331
  GO TO 250              NASNU160   332
10J F1A(1)=F1U(1)         NASNU161   333
  F1A(2)=F1U(2)
  DO 1J1 I=1,4            NASNU162   334
101 A(I)=A(I+4)
  F10A(1)=F10J(1)
  F10A(2)=F10B(2)
  GO TO 52                NASNU163   335
C* CTRAPRG,CFLJID4      NASNU164   336
11J DO 112 I=1,4           NASNU165   337
112 KG(I)=A(I+1)+0.5     NASNU166   338
  GO TO 250              NASNU167   339
C* CTRIARG,CFLUID3      NASNU168   340
114 DO 115 I=1,3           NASNU169   341
115 KG(I)=A(I+1)+0.5     NASNU170   342
  GO TO 250              NASNU171   343
C* CQDMEM,CQDPLT,CQUAD1,CQUAD2,CQUAD3,CSHEAR,CTWIST,CIS2D4,CTETRA
12J DO 13J I=1,4           NASNU172   344
13J KG(I)=A(I+2)+0.5     NASNU173   345
  GO TO 250              NASNU174   346
C* CTRBSC, CTRIA1, CTRIA2, CTRMEM, CTRPLT, CHTRI2
14J DO 15J I=1,3           NASNU175   347
15J KG(I)=A(I+2)+0.5     NASNU176   348
  GO TO 250              NASNU177   349
C* CBAR, CGONEAX, CTORDR
16J DO 17J I=1,2           NASNU178   350
17J KG(I)=A(I+2)+0.5     NASNU179   351
  GO TO 250              NASNU180   352
C* CROD, CTUBE, CVISC, CDAMP3, CDAMP4, CELASS, CELAS4, CMASS3, CMASS4
18J DO 19J I=1,2           NASNU181   353
19J KG(I)=A(I+2)+0.5     NASNU182   354
  GO TO 250              NASNU183   355
C* CONROD,CFLUID2
20J DO 21J I=1,2           NASNU184   356
21J KG(I)=A(I+1)+0.5     NASNU185   357
  GO TO 250              NASNU186   358
C* CELAS1, CELAS2, CUDMPI, CUDMP2, CMASS1, CMASS2
22J KG(I)=A(3)+0.5        NASNU187   359
  KG(2)=A(5)+0.5        NASNU188   360
  GO TO 250              NASNU189   361
C SET LOOP=2 SINCE 2 ELEMENTS MAY BE DEFINED ON ONE CARD.
  LOOP=2                  NASNU190   362
  GO TO 250              NASNU191   363
C* CONROD,CFLUID2
20J DO 21J I=1,2           NASNU192   364
21J KG(I)=A(I+1)+0.5     NASNU193   365
  GO TO 250              NASNU194   366
C PROCESS MPC CARDS.
23J NCON=NMPc             NASNU195   367
  KG(I)=A(2)+0.5        NASNU196   368
  GO TO 250              NASNU197   369
C* CONROD,CFLUID2
20J DO 21J I=1,2           NASNU198   370
21J KG(I)=A(I+1)+0.5     NASNU199   371
  GO TO 250              NASNU200   372
C* CQUAD1,CQUAD2,CQUAD3,CSHEAR,CTWIST,CIS2D4,CTETRA
12J DO 13J I=1,4           NASNU201   373
13J KG(I)=A(I+2)+0.5     NASNU202   374
  GO TO 250              NASNU203   375
C* CTRBSC, CTRIA1, CTRIA2, CTRMEM, CTRPLT, CHTRI2
14J DO 15J I=1,3           NASNU204   376
15J KG(I)=A(I+2)+0.5     NASNU205   377
  GO TO 250              NASNU206   378
C* CBAR, CGONEAX, CTORDR
16J DO 17J I=1,2           NASNU207   379
17J KG(I)=A(I+2)+0.5     NASNU208   380
  GO TO 250              NASNU209   381
C* CROD, CTUBE, CVISC, CDAMP3, CDAMP4, CELASS, CELAS4, CMASS3, CMASS4
18J DO 19J I=1,2           NASNU210   382
19J KG(I)=A(I+2)+0.5     NASNU211   383
  GO TO 250              NASNU212   384
  LG(I)=A(I+6)+0.5       NASNU213   385
  GO TO 250              NASNU214   386
C SET LOOP=2 SINCE 2 ELEMENTS MAY BE DEFINED ON ONE CARD.
  LOOP=2                  NASNU215   387
  GO TO 250              NASNU216   388
C* CONROD,CFLUID2
20J DO 21J I=1,2           NASNU217   389
21J KG(I)=A(I+1)+0.5     NASNU218   390
  GO TO 250              NASNU219   391
C* CQUAD1,CQUAD2,CQUAD3,CSHEAR,CTWIST,CIS2D4,CTETRA
12J DO 13J I=1,4           NASNU220   392
13J KG(I)=A(I+2)+0.5     NASNU221   393
  GO TO 250              NASNU222   394
C* CELAS1, CELAS2, CUDMPI, CUDMP2, CMASS1, CMASS2
22J KG(I)=A(3)+0.5        NASNU223   395
  KG(2)=A(5)+0.5        NASNU224   396
  GO TO 250              NASNU225   397
C PROCESS MPC CARDS.
23J NCON=NMPc             NASNU226   398
  KG(I)=A(2)+0.5        NASNU227   399
  GO TO 250              NASNU228   400

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KG(2)=A(5)+0.5
I=2
240 READ(8,10)F1A,(A(J),J=1,4),F10A
  IF(F10B(1).NE.F1A(1).OR.F10B(2).NE.F1A(2)) GO TO 250
  I=I+1
  IF(I.GT.NMPC)GO TO 245
  F10B(1)=F10A(1)
  F10B(2)=F10A(2)
  KK=2
  IF(MOD(I,2).EQ.0)KK=1
  KG(I)=A(KK)+0.5
  GO TO 240
245 WRITE(6,246) NMPC
246 FORMAT(36H1 AN MPC EQUATION CONTAINS MORE THAN,I5,8H TERMS./
 + 14H FATAL ERROR. )
 CALL 80H3II(5)
C PROCESS KG (AND LG IF LOOP=2) ARRAY.
250 DO 480 KK=1,LOOP
  IF(KK.EQ.1)GO TO 300
  DO 260 I=1,4
  260 KG(I)=LG(I)
C SCATTER SEARCH AND CONVERT KG TO TEMPORARY SET OF INTERNAL NUMBERS.
300 CALL SCAT(KG,NCON,NEW,INV,II3,NORIG)
  IF(IETYPE.NE.20)GO TO 420
C SAVE MPC GRID POINTS FOR LATER PROCESSING BY TIGER.
  NEQ=NEQ+1
  WRITE(11)KG
  GO TO 45
C FILL CONNECTION TABLE ARRAY IG.
420 IEND=NCON-1
  NEL=NEL+1
  DO 450 I=1,IEND
  L=I+1
  DO 450 J=L,NCON
  450 CALL SETIG(KG(I),KG(J),IG,III,NORIG)
480 CONTINUE
  IF(F18(1).EQ.F10A(1).AND.F18(2).EQ.F10A(2)) GO TO 40
  IF(NCON.GE.8) GO TO 40
  F1A(1)=F1U(1)
  F1A(2)=F1U(2)
  DO 495 I=1,4
  495 A(I)=ATEMP(I)
  F10A(1)=F10B(1)
  F10A(2)=F10B(2)
  GO TO 45
500 NN=NEW
  IF(NEW.GT.0) GO TO 502
  WRITE(6,2)
  IPARAM(9)=4
  RETURN
502 IF(IPARAM(4).EQ.3)GO TO 505
C MODIFY CONNECTION TABLE TO ACCOUNT FOR MPC EQUATIONS.
  CALL TIGER(NEQ,IG,III,ILD,NORIG)
  NDEP=NN
  CALL FIXIT(ILD,NDEP)
C GENERATE NEW IG AND NORIG ARRAYS.
505 CALL BRIGIT(IG,III,INV,II3,INT,ICC,NORIG,IP)
C PRINT INTERNAL/EXTERNAL CORRESPONDENCE TABLE.
  LEN=50
  IF(IPARAM(10).EQ.5) GO TO 560
  J=0
510 WRITE(6,19)
520 J=J+1
  KEND=0
  DO 530 K=1,9,2
  L=J+LEN*(K-1)/2
  LINE(K)=L
  IF(L.GT.NEW) GO TO 550
  KEND=K+1
530 LINE(K+1)=NORIG(L)
550 CONTINUE
  IF(KENU.EQ.0)GO TO 560
  WRITE(6,11)(LINE(K),K=1,KEND)
  IF(MOD(J,LEN).NE.0)GO TO 520
  J=J+*LEN
  IF(J.LT.NEW) GO TO 510
560 CONTINUE
C CONVERT ISTART,IGNORE,IFIRST FROM ORIGINAL TO INTERNAL NUMBERS.
  I=ISTA+IIG+IFIR
  IF(I.LE.0) GO TO 570
  CALL FLIP(ISTART,ISTA,INV,II3,ICC)
  CALL FLIP(IGNORE,IIG ,INV,II3,ICC)
  CALL FLIP(IFIRST,IFIR,INV,II3,ICC)
  IF(IPARAM(10).EQ.5) GO TO 570
C PRINT INTERNAL NUMBERS FOR $-CARDS.
  WRITE(6,561)
561 FORMAT(30H1 & CARDS (INTERNAL NUMBERS) /)
  IF(ISTA.GT.0) WRITE(6,562) (ISTART(I),I=1,ISTA)
  IF(IIG .GT.0) WRITE(6,564) (IGNORE(I),I=1,IIG )
  IF(IFIR.GT.0) WRITE(6,566) (IFIRST(I),I=1,IFIR)
562 FORMAT(9H $START ,20I5/100(9X,20I5/))
564 FORMAT(9H $IGNORE ,20I5/100(9X,20I5/))
566 FORMAT(9H $FIRST ,20I5/100(9X,20I5/))
570 CONTINUE
C SET UP LIST OF POINTS TO IGNORE IN INT ARRAY.
  K=0
  IF(IPARAM(4).EQ.3) GO TO 920
  IF(NDEP.LE.0) GO TO 920
C MPC DEPENDENT POINTS FIRST.
  DO 915 I=1,NDEP
    NASNU229      401
    NASNU230      402
    NASNU231      403
    NASNU232      404
    NASNU233      405
    NASNU234      406
    NASNU235      407
    NASNU236      408
    NASNU237      409
    NASNU238      410
    NASNU239      411
    NASNU240      412
    NASNU241      413
    NASNU242      414
    NASNU243      415
    NASNU244      416
    NASNU245      417
    NASNU246      418
    NASNU247      419
    NASNU248      420
    NASNU249      421
    NASNU250      422
    NASNU251      423
    NASNU252      424
    NASNU253      425
    NASNU254      426
    NASNU255      427
    NASNU256      428
    NASNU257      429
    NASNU258      430
    NASNU259      431
    NASNU260      432
    NASNU261      433
    NASNU262      434
    NASNU263      435
    NASNU264      436
    NASNU265      437
    NASNU266      438
    NASNU267      439
    NASNU268      440
    NASNU269      441
    NASNU270      442
    NASNU271      443
    NASNU272      444
    NASNU273      445
    NASNU274      446
    NASNU275      447
    NASNU276      448
    NASNU277      449
    NASNU278      450
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    NASNU280      452
    NASNU281      453
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    NASNU283      455
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    NASNU286      458
    NASNU287      459
    NASNU288      460
    NASNU289      461
    NASNU290      462
    NASNU291      463
    NASNU292      464
    NASNU293      465
    NASNU294      466
    NASNU295      467
    NASNU296      468
    NASNU297      469
    NASNU298      470
    NASNU299      471
    NASNU300      472
    NASNU301      473
    NASNU302      474
    NASNU303      475
    NASNU304      476
    NASNU305      477
    NASNU306      478
    NASNU307      479
    NASNU308      480
    NASNU309      481
    NASNU310      482
    NASNU311      483
    NASNU312      484
    NASNU313      485
    NASNU314      486
    NASNU315      487
    NASNU316      488
    NASNU317      489
    NASNU318      490
    NASNU319      491
    NASNU320      492
    NASNU321      493
    NASNU322      494
    NASNU323      495
    NASNU324      496
    NASNU325      497
    NASNU326      498
    NASNU327      499
    NASNU328      500

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J=ILD(I)
IF(J.LE.0) GO TO 915
K=K+1
INT(K)=ICC(J)
IF(K.GE.MAXGRD) CALL FIXIT(INT,K)
915 CONTINUE
920 IF(IGDEG.LE.0) GO TO 940
C GRID POINTS WITH DEGREE.GT.IGDEG SECOND.
    IF(IGDEG.GE.MM) GO TO 940
    CALL DEGREE(IG,III,INV)
C HERE, INV(I)=DEGREE OF GRID POINT I
    DO 930 I=1,NN
    IF(JNV(I).LE.IGDEG) GO TO 930
    K=K+1
    INT(K)=I
    IF(K.GE.MAXGRD) CALL FIXIT(INT,K)
930 CONTINUE
940 IF(II.GE.0) GO TO 960
C IGNORE POINTS THIRD.
    DO 950 I=1,IIIG
    J=IGNORE(I)
    IF(J.LE.0) GO TO 950
    K=K+1
    INT(K)=J
    IF(K.GE.MAXGRD) CALL FIXIT(INT,K)
950 CONTINUE
C K=NUMBER OF POINTS TO BE IGNORED BEFORE COMPRESSING LIST.
960 IF(K.LE.0) GO TO 970
C DELETE POINTS LISTED IN INT ARRAY FROM CONNECTION TABLE IG.
    CALL MORRIS(INT,K,IG,III)
970 CONTINUE
C RENUMBER NODES WITH SUBROUTINE SCHEME.
    IF(IPARAM(10).EQ.6) IARG(5)=1
    II8=II3/2
    CALL SCHEME(IARG(1),IARG(2),IARG(3),IARG(4),IARG(5),IG,III,
    + JNV(1),JNV(II8+1),JNV(2*II8+1),JNV(3*II8+1),INT,ICC,ILD,IP)
    IF(IPARAM(10).EQ.5) GO TO 580
    WRITE(6,4)IB
C WRITE NEW NASTRAN DATA DECK.
580 READ(9,918
    WRITE(8,9)B
    IF(B(1).NE.BEGIN) GO TO 580
590 READ(9,918
    IF(B(1).GE.SEQG.OR.B(1).EQ.ENDD) GO TO 600
    WRITE(8,9)B
    GO TO 593
C WRITE SEQGP CARDS.
600 KREM=MOD(NEW,4)
    IF(NEW.GE.4) GO TO 605
    KBEG=1
    GO TO 612
605 IEND=NEW-KREM-3
    DO 610 K=1,IEND,4
    L=K+3
610 WRITE(8,12) (NORIG(I),ILD(I),I=K,L)
    IF(KREM.EQ.0) GO TO 620
    KBEG=IEND+4
612 DO 615 I=KBEG,NEW
615 WRITE(8,8) NORIG(I),ILD(I)
C WRITE THE REMAINDER OF THE NASTRAN DECK.
620 WRITE(8,918
    IF(B(1).EQ.END) GO TO 700
    READ(9,9)B
    GO TO 620
700 CONTINUE
    IF(IPARAM(10).EQ.5) GO TO 900
C PRINT ORIGINAL GRID POINT CONNECTION TABLE.
    MAXD=MM
    L=MAXD/11+1
    L=LEN/L
705 FORMAT(10H1      GRID,5X,5H MAX,15X,13H*CONNECTIONS*,5X,
    + 23H(ORIGINAL GRID NUMBERS) /5X,
    + 20HPOINT COMP DIST. DEGR ,11(8X,1H*) )
710 FORMAT(1I0,3I5,1I9/25(25X,1I9/))
    DO 750 I=1,NN
    IF(MOD(I,L).EQ.1) WRITE(6,705)
    DO 720 J=1,MAXD
720 IP(J)=0
C CALCULATE MDIST AND PRINT TABLE.
    MDIST=0
    DO 725 J=1,MAXD
    K=IG(I,J)
    IF(K.EQ.0) GO TO 725
    MDIST=MAX0(MDIST,IABS(I-K))
    IP(J)=NORIG(K)
725 CONTINUE
    K=NORIG(I)
    IP1=INV(I,1)
    IP2=INV(MAXGRD+I,1)
750 WRITE(6,710) K,IP1,MUINST,IP2,(IP(J),J=1,MAXD)
C PRINT CONNECTION TABLE FOR RENUMBERED NUMBERS.
    DO 780 I=1,NEW
780 ICC(I)=ILD(I)
    CALL SWITCH(IG,III,INT,ICC,IP(1),IP(MAXDEG+1))
    CALL DEGREE(IG,III,JNV(1),JNV(II8+1))
    L=COMPNT(IG,III,JNV(1),JNV(II8+1),JNV(3*II8+1),ICC)
    L=MAXD/26+1
    L=LEN/L
805 FORMAT(37H1LABEL COMP MDIST DEGR CONNECTIONS ,10X,
    + 20H(RENUMBERED NUMBERS) )

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810 FORMAT(5I6,20I9/ 2>(25X,2I15/))
 00 85J I=1,NN
  IF(MOJ(I,L)<L4.1) WRITE(6,805)
  00 82J J=1,MAXU
  820 IP(J)=0
C CALCULATE MUIST AND PRINT TABLE.
  MUIST=0
  DO 825 J=1,MAXU
  K=10(I,J)
  IF(K<LQ,J) GO TO 825
  MUIST=MAX0(MUIST,IABS(I-K))
  IP(J)=K
  825 CONTINUE
C INV(I,1)=IC(I) BEFORE PACKING
C INV(MAXGRD+I,1)=IEBL(I) BEFORE PACKING
  IP1=INV(I,1)
  IP2=INV(MAXGRD+I,1)
  850 WRITE(6,810) I,IP1,MUIST,IP2,(IP(J),J=1,MAXU)
  900 RETURN
  END
  SUBROUTINE FLIP(LIST,N,INV,II3,ICC)
C CONVERT 3-ARRAY LIST OF LENGTH N FROM ORIGINAL TO INTERNAL NUMBERS.
  COMMON /A/ MAXGRD,MAXDEG,KM00
  DIMENSION LIST(1),INV(II3,2),ICC(1)
C CHECK FOR DUPLICATE AND ZERO ENTRIES AND REDUCE N IF NECESSARY.
  CALL FIXIT(LIST,N)
  IF(N.LL.0) RETURN
  DO 20 I=1,N
  J=LIST(I)
  IF(J.LL.0) GO TO 30
  LOC=J-1
  10 LOC=MOD(LOC,KM00)+1
  IF(INV(LOC,1).EQ.0) GO TO 30
  IF(INV(LOC,1).NE.J) GO TO 10
  K=INV(LOC,2)
  LIST(I)=ICC(K)
  20 CONTINUE
  RETURN
C ABORT BANJO DUE TO ILLEGAL GRID POINT REFERENCE ON $-CONTROL CARD.
  30 WRITE(6,40) J
  40 FORMAT(11HGRID POINT, I10,30H APPEARING ON A $ CARD IS NOT , + 25H A STRUCTURAL GRID POINT. /134 FATAL ERROR. )
  CALL BOMBIT(8)
  END
  SUBROUTINE GOOGAN(KA,K3,NIN,NOUT)
C THIS ROUTINE READS A NASTRAN DATA DECK AND RIGHT-ADJUSTS ALL
C BULK DATA IN ITS FIELDS.
C IN ADDITION, THE CALLING ARGUMENTS PROVIDE THE FOLLOWING OPTIONS -
C   KA=1, PROCESS ALL CARDS IN THE NASTRAN DATA DECK, OR
C   =2, PROCESS ONLY THOSE CARDS WITH A C OR G IN COLUMN 1,
C      MPC CARDS, AND THOSE CONTINUATION CARDS WITH ALL
C      NUMERIC FIELDS. THE ENDDATA CARD IS WRITTEN IN ANY CASE.
C   KB = 1, CONVERT ALL 8-COLUMN FIELDS TO 16-COLUMN FIELDS, OR
C   = 2, THE FIELD WIDTHS REMAIN UNCHANGED.
C   NIN = THE LOGICAL UNIT FROM WHICH THE INPUT DECK IS READ.
C   NOUT = THE LOGICAL UNIT ON WHICH THE OUTPUT IS WRITTEN.
C NEITHER NIN NOR NOUT ARE REWOUND IN THIS ROUTINE.
C IF AN ASTERISK APEARS IN FIELD 1 AFTER THE MNEMONIC, IT IS LEFT-
C ADJUSTED AGAINST THE MNEMONIC.
C THE FOLLOWING TWO (2) CARDS ARE REQUIRED IN THE DATA DECK =
C   (1) A BEGIN BULK CARD TO INDICATE THE BEGINNING OF THE
C       BULK DATA DECK, AND
C   (2) AN ENDDATA CARD TO INDICATE THE END OF THE DATA DECK.
C ALL CARDS PRECEDING THE BEGIN BULK CARD ARE WRITTEN ON NOUT IFF KA=1.
C DIMENSION ANUM(10)
  COMMON A(80),IP(40)
  COMMON IA,IB,ICARJ,IFLAG,J,JNB,L,MKHOLU,MKINSR,MKNIN
  COMMON NJLANK,NFIELD,I,ICOL,IFIELD,IPROC,ITYPE
  COMMON K,KAST,KBLK,MKI,HKJ,NCOL,NIP,IN
  COMMON /A/ MAXGRD,MAXDEG,KM00,NMPC
  COMMON /3/ IPARAM(20),IARG(5)
  COMMON /DOL/ ISTART(100),IGNORE(100),IFIRST(100)
  COMMON /DOL/ IDIM,ISTA,IIIG,IFIR,IGOEG,ISCH
  COMMON /NG/ NGRD
  REAL M,N,I,LL,JJ,KK
  INTEGER EOF
C DATA CARDS FOR ALPHABET (ALLOWS FOR FUTURE ADDITIONS TO
C   USER OPTION LIST).
  DATA J,C,D,E,F,M,N,P/1H3,1H0,1H0,1HE,1HG,1HM,1HN,1HP/
  DATA AA,II,LL,O,R/1H4,1H1,1HL,1HO,1HR/
  DATA Q,S,T,U,Y/1H4,1HS,1HT,1HU,1HY/
  DATA F,H,J,J,K/K/1HF,1HH,1HJ,1HK/
  DATA V,W,X,Z/1HV,1HH,1HX,1HZ/
  DATA ASTER,PLUS,BLANK,DOLLAR/1H*,1H+,1H ,1H$/
  DATA ANUM/1H0,1H1,1H2,1H3,1H4,1H5,1H6,1H7,1H8,1H9/
  DATA LFLAG/0/
  DATA I80M8,I80M4/0,0/
  LFLAG=LFLAG+1
  9 FORMAT(1H1)
  10 FORMAT(8A1)
  11 FORMAT(8A1,4(8X,8A1),3H*XZ,I5/3H*XZ,I5,4(8X,8A1),8A1)
  ICARD=0
  MKINSR=12
  MKNIN=NIN
C READ EXECUTIVE OR CASE CONTROL CARD.
  20 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 21
  IF(NIN.EQ.MKNIN) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  21 CONTINUE
  22 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 23
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  23 CONTINUE
  24 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 25
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  25 CONTINUE
  26 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 27
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  27 CONTINUE
  28 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 29
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  29 CONTINUE
  30 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 31
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  31 CONTINUE
  32 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 33
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  33 CONTINUE
  34 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 35
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  35 CONTINUE
  36 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 37
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  37 CONTINUE
  38 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 39
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  39 CONTINUE
  40 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 41
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  41 CONTINUE
  42 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 43
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  43 CONTINUE
  44 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 45
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  45 CONTINUE
  46 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 47
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  47 CONTINUE
  48 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 49
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  49 CONTINUE
  50 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 51
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  51 CONTINUE
  52 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 53
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  53 CONTINUE
  54 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 55
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  55 CONTINUE
  56 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 57
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  57 CONTINUE
  58 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 59
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  59 CONTINUE
  60 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 61
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  61 CONTINUE
  62 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 63
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  63 CONTINUE
  64 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 65
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  65 CONTINUE
  66 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 67
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  67 CONTINUE
  68 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 69
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  69 CONTINUE
  70 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 71
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  71 CONTINUE
  72 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 73
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  73 CONTINUE
  74 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 75
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  75 CONTINUE
  76 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 77
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  77 CONTINUE
  78 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 79
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  79 CONTINUE
  80 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 81
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  81 CONTINUE
  82 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 83
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  83 CONTINUE
  84 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 85
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  85 CONTINUE
  86 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 87
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  87 CONTINUE
  88 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 89
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  89 CONTINUE
  90 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 91
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  91 CONTINUE
  92 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 93
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  93 CONTINUE
  94 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 95
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  95 CONTINUE
  96 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 97
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  97 CONTINUE
  98 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 99
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  99 CONTINUE
  100 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 101
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  101 CONTINUE
  102 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 103
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  103 CONTINUE
  104 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 105
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  105 CONTINUE
  106 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 107
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  107 CONTINUE
  108 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 109
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  109 CONTINUE
  110 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 111
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  111 CONTINUE
  112 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 113
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  113 CONTINUE
  114 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 115
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  115 CONTINUE
  116 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 117
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  117 CONTINUE
  118 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 119
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  119 CONTINUE
  120 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 121
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  121 CONTINUE
  122 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 123
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  123 CONTINUE
  124 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 125
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  125 CONTINUE
  126 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 127
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  127 CONTINUE
  128 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 129
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  129 CONTINUE
  130 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 131
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  131 CONTINUE
  132 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 133
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  133 CONTINUE
  134 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 135
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  135 CONTINUE
  136 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 137
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  137 CONTINUE
  138 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 139
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  139 CONTINUE
  140 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 141
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  141 CONTINUE
  142 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 143
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  143 CONTINUE
  144 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 145
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  145 CONTINUE
  146 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 147
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  147 CONTINUE
  148 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 149
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  149 CONTINUE
  150 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 151
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  151 CONTINUE
  152 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 153
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  153 CONTINUE
  154 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 155
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  155 CONTINUE
  156 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 157
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  157 CONTINUE
  158 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 159
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  159 CONTINUE
  160 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 161
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  161 CONTINUE
  162 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 163
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  163 CONTINUE
  164 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 165
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  165 CONTINUE
  166 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 167
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  167 CONTINUE
  168 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 169
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  169 CONTINUE
  170 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 171
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  171 CONTINUE
  172 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 173
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  173 CONTINUE
  174 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 175
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  175 CONTINUE
  176 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 177
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  177 CONTINUE
  178 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 179
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  179 CONTINUE
  180 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 181
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  181 CONTINUE
  182 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 183
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  183 CONTINUE
  184 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 185
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  185 CONTINUE
  186 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 187
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  187 CONTINUE
  188 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 189
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  189 CONTINUE
  190 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 191
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  191 CONTINUE
  192 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 193
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  193 CONTINUE
  194 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 195
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  195 CONTINUE
  196 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 197
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  197 CONTINUE
  198 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 199
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  199 CONTINUE
  200 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 201
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  201 CONTINUE
  202 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 203
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  203 CONTINUE
  204 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 205
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  205 CONTINUE
  206 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 207
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  207 CONTINUE
  208 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 209
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  209 CONTINUE
  210 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 211
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  211 CONTINUE
  212 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 213
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  213 CONTINUE
  214 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 215
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  215 CONTINUE
  216 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 217
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  217 CONTINUE
  218 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 219
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  219 CONTINUE
  220 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 221
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  221 CONTINUE
  222 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 223
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  223 CONTINUE
  224 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 225
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  225 CONTINUE
  226 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 227
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  227 CONTINUE
  228 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 229
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  229 CONTINUE
  230 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 231
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  231 CONTINUE
  232 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 233
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  233 CONTINUE
  234 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 235
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  235 CONTINUE
  236 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 237
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  237 CONTINUE
  238 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 239
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  239 CONTINUE
  240 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 241
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  241 CONTINUE
  242 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 243
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  243 CONTINUE
  244 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 245
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  245 CONTINUE
  246 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 247
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  247 CONTINUE
  248 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 249
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  249 CONTINUE
  250 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 251
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  251 CONTINUE
  252 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 253
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  253 CONTINUE
  254 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 255
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  255 CONTINUE
  256 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 257
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  257 CONTINUE
  258 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 259
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  259 CONTINUE
  260 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 261
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  261 CONTINUE
  262 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 263
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  263 CONTINUE
  264 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 265
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  265 CONTINUE
  266 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 267
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  267 CONTINUE
  268 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 269
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  269 CONTINUE
  270 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 271
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  271 CONTINUE
  272 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 273
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  273 CONTINUE
  274 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 275
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  275 CONTINUE
  276 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 277
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  277 CONTINUE
  278 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 279
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  279 CONTINUE
  280 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 281
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  281 CONTINUE
  282 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 283
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  283 CONTINUE
  284 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 285
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  285 CONTINUE
  286 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 287
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  287 CONTINUE
  288 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 289
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  289 CONTINUE
  290 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 291
  IF(NIN.EQ.MKINR) CALL BOMBIT(1)
  MKINR=JENIN
  NIN=MKINR
  291 CONTINUE
  292 READ(NIN,10) A
  IF(EOP(NIN).EQ.0) GO TO 293
  IF(NIN.EQ.MKINR) CALL
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      MKINSR=MKHOLD
      GO TO 20
21   IFLAG=0
      ICARD=ICARD+1
C PROCESS OUTPUT OPTION CARD, IF PRESENT.
      IF((A(1).NE.DOLLAR))GO TO 20
      IF(LFLAG.GT.1) GO TO 29
C LOOK FOR FIRST KEYWORD.
      ITYPE=0
      IF(A(2).EQ.P.ANU.A(3).EQ.U)ITYPE=1
      IF(A(2).EQ.M.AND.A(3).EQ.P)ITYPE=4
      IF(A(2).EQ.S.ANU.A(3).EQ.E)ITYPE=5
      IF(A(2).EQ.R.AND.A(3).EQ.II)ITYPE=6
      IF(A(2).EQ.N.AND.A(3).EQ.AA)ITYPE=8
      IF(A(2).EQ.P.AND.A(3).EQ.R)ITYPE=10
      IF(A(2).EQ.S.AND.A(3).EQ.C)GO TO 1100
      IF(A(2).EQ.3.ANU.A(3).EQ.T) GO TO 1200
      IF(A(2).EQ.D.AND.A(3).EQ.E) GO TO 1250
      IF(A(2).EQ.F.AND.A(3).EQ.II) GO TO 1300
      IF(A(2).EQ.II.AND.A(3).EQ.G) GO TO 1350
      IF(A(2).EQ.Q.ANU.A(3).EQ.R) GO TO 1380
      IF(A(2).EQ.AA.ANU.A(3).EQ.T) ITYPE=12
      IF(A(2).EQ.W.ANU.A(3).EQ.AA) ITYPE=13
      IF(A(2).NE.II.OR.A(3).NE.N)GO TO 1025
C INSERT CARDS FROM ALTERNATE FILE
      IPARAM(11)=1
      MKHOLJ=NIN
      NIN=MKINSR
      MKINSR=MKHOLJ
      DO 1021 MKI=2,80
      MKJ=81-MKI
1021  A(MKJ+1)=A(MKJ)
      IPARAM(6)=
      1025 IF(ITYPE.EQ.0)GO TO 26
C LOOK FOR SECOND KEYWORD.
      I=3
22   I=I+1
      IF(I.GE.79)GO TO 26
      IF(A(I).NE.BLANK)GO TO 22
24   I=I+1
      IF(I.GE.50)GO TO 26
      IF(A(I).EQ.BLANK)GO TO 24
      J=0
      IF(A(I).EQ.S.AND.A(I+1).EQ.E)J=1
      IF(A(I).EQ.AA.AND.A(I+1).EQ.LL)J=2
      IF(A(I).EQ.N.AND.A(I+1).EQ.O)J=3
      IF(A(I).EQ.Y.ANU.A(I+1).EQ.E)J=4
      IF(A(I).EQ.H.AND.A(I+1).EQ.II) J=5
      IF(A(I).EQ.M.AND.A(I+1).EQ.AA) J=6
      IF(J.EQ.0)GO TO 26
C SET PARAMETER.
      IPARAM(ITYPE)=J
      GO TO 26
C READ $SCHEME CARD.
1100  CALL REAJIT(A,IP,NIP)
      ISCH=1
      I=MIND(NIP,5)
      IF(I.EQ.0) GO TO 29
      DO 1110 J=1,I
1110  IARG(J)=IP(J)
      GO TO 29
C READ $START CARD.
1200  CALL READIT(A,IP,NIP)
      I=ISTA
      ISTA=ISTA+NIP
      IF(ISTA.LE.IDIM) GO TO 1205
      IBOM=2
      ISTA=IDIM
      GO TO 29
1205  DO 1210 J=1,NIP
1210  ISTART(I+J)=IP(J)
      GO TO 29
C READ $DEGREE CARD.
1250  CALL REAJIT(A,IP,NIP)
      IGDEG=IP(1)
      GO TO 29
C READ $FIRST CARD.
1300  CALL REAJIT(A,IP,NIP)
      I=IFIR
      IFIR=IFIR+NIP
      IF(IFIR.LE.IDIM) GO TO 1308
      IBOM=2
      IFIR=IDIM
      GO TO 29
1308  DO 1310 J=1,NIP
1310  IFIRST(I+J)=IP(J)
      GO TO 29
C READ $IGNORE CARD.
1350  CALL READIT(A,IP,NIP)
      I=IG
      IIG=IIG+NIP
      IF(IIG.LE.IDIM) GO TO 1360
      IBOM=2
      IIG=IDIM
      GO TO 29
1360  DO 1365 J=1,NIP
1365  IGNORE(I+J)=IP(J)
      GO TO 29
C READ $GRID CARD.
1380  CALL READIT(A,IP,NIP)

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GOOGAN58	701
GOOLAN59	702
GOOGAN60	703
GOOGAN61	704
GOOGAN62	705
GOOGAN63	706
GOOGAN64	707
GOOGAN65	708
GOOGAN66	709
GOOGAN67	710
GOOGAN68	711
GOOGAN69	712
GOOGAN70	713
GOOGAN71	714
GOOGAN72	715
GOOGAN73	716
GOOGAN74	717
GOOGAN75	718
GOOGAN76	719
GOOGAN77	720
GOOGAN78	721
GOOGAN79	722
GOOGAN80	723
GOOGAN81	724
GOOGAN82	725
GOOGAN83	726
GOOGAN84	727
GOOGAN85	728
GOOGAN86	729
GOOGAN87	730
GOOGAN88	731
GOOGAN89	732
GOOGAN90	733
GOOGAN91	734
GOOGAN92	735
GOOGAN93	736
GOOGAN94	737
GOOGAN95	738
GOOGAN96	739
GOOGAN97	740
GOOGAN98	741
GOOGAN99	742
GOOGA100	743
GOOGA101	744
GOOGA102	745
GOOGA103	746
GOOGA104	747
GOOGA105	748
GOOGA106	749
GOOGA107	750
GOOGA108	751
GOOGA109	752
GOOGA110	753
GOOGA111	754
GOOGA112	755
GOOGA113	756
GOOGA114	757
GOOGA115	758
GOOGA116	759
GOOGA117	760
GOOGA118	761
GOOGA119	762
GOOGA120	763
GOOGA121	764
GOOGA122	765
GOOGA123	766
GOOGA124	767
GOOGA125	768
GOOGA126	769
GOOGA127	770
GOOGA128	771
GOOGA129	772
GOOGA130	773
GOOGA131	774
GOOGA132	775
GOOGA133	776
GOOGA134	777
GOOGA135	778
GOOGA136	779
GOOGA137	780
GOOGA138	781
GOOGA139	782
GOOGA140	783
GOOGA141	784
GOOGA142	785
GOOGA143	786
GOOGA144	787
GOOGA145	788
GOOGA146	789
GOOGA147	790
GOOGA148	791
GOOGA149	792
GOOGA150	793
GOOGA151	794
GOOGA152	795
GOOGA153	796
GOOGA154	797
GOOGA155	798
GOOGA156	799
GOOGA157	800

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      NGRID=IP(1)
      GO TO 29
C LOOK FOR BEGIN BULK CARD.
 26 I=0
 27 I=I+1
      IF(I.GT.75) GO TO 29
      IF(A(I).EQ.BLANK) GO TO 27
      IF(A(I).NE.BIGU) GO TO 29
      IF(A(I+1).NE.E) GO TO 29
      IF(A(I+2).NE.G) GO TO 29
      IF(A(I+3).NE.II) GO TO 29
      IFLAG=1
C LEFT-ADJUST BEGIN BULK CARD.
      K=73-I
      DO 28 J=1,72
      IF(J.LE.K) A(J)=A(J+I-1)
 28 IF(J.GT.K) A(J)=BLANK
      IF(IFLAG.GT.1) GO TO 29
C REJECT ILLEGAL PARAMETERS AND SET TO DEFAULTS.
      IF(IPARAM(1).NE.2.AND.IPARAM(1).NE.3) IPARAM(1)=1
      DO 1450 I=2,9
 1450 IF(IPARAM(I).NE.4) IPARAM(I)=3
      IF(IPARAM(10).NE.6) IPARAM(10)=5
      IF(IPARAM(12).NE.3) IPARAM(12)=4
      IF(IPARAM(13).NE.4) IPARAM(13)=3
      CALL GRIJ(NGRID)
      I=ISTA+IIG+IFIR+ISCH+IGDEG
      IF(I.LE.0) GO TO 29
C CHECK FOR ILLEGAL SCHEME ARGUMENTS.
      DO 1450 I=1,3
 1460 IF(IARG(1).LT.1.OR.IARU(1).GT.MAXGRD) IB01B=1
      IF(IARG(4).LT.2.OR.IARG(4).GT.3) IB0MB=1
      IF(IARG(5).LT.0.OR.IARU(5).GT.1) IB0Md=1
      WRITE(6,3)
      IF(ISCH.GT.0) WRITE(6,1500) (IARG(I),I=1,5)
 1500 FORMAT(//,9H ISCHEM,10I10/200(9X,10I10/))
      IF(ISTA.GT.0) WRITE(6,1505) (ISTART(I),I=1,ISTA)
 1505 FORMAT(//,9H $START ,10I10/200(9X,10I10/))
      IF(IGDEG.GT.0) WRITE(6,1510) IGDEG
 1510 FORMAT(//,9H $DEGREE ,10I10/200(9X,10I10/))
      IF(IFIR.GT.0) WRITE(6,1515) (IFIRST(I),I=1,IFIR)
 1515 FORMAT(//,9H $FIRST ,10I10/200(9X,10I10/))
      IF(IIG.GT.0) WRITE(6,1520) (IGNORE(I),I=1,IIG)
 1520 FORMAT(//,9H $IGNORE ,10I10/200(9X,10I10/))
      IF(IB0MB.EQ.1) CALL BOMBIT(4)
      IF(IB0M.EQ.2) CALL BOMBIT(9)
 29 IF(KA.EQ.1) WRITE(6,1521)
      IF(IFLAG.EQ.JIGO) GO TO 20
C RETURN IF RIGHT-ADJUSTING OF CARDS IS NOT NEEDED.
      IF(IPARAM(5).EQ.3.AND.IPARAM(6).EQ.3) RETURN
C READ BULK DATA CARD.
 30 READ(NIN,10) A
      IF(EOP(NIN).EQ.0) GO TO 31
      IF(NIN.EQ.1) MKNIN CALL BOMBIT(1)
C SWITCH INPUT FILES
      MKHOL=MKHOL+NIN
      NIN=MKINS
      MKINS=R=MKHOLD
      GO TO 30
 31 ICARD=ICARD+1
C LEFT-ADJUST FIRST FILE.
      DO 1620 I=1,8
      IF(A(I).NE.BLANK) GO TO 1610
 1600 CONTINUE
      GO TO 30
 1610 IF(I.EQ.1) GO TO 1650
      J=I-1
      K=8-J
      DO 1620 I=1,K
      A(I)=A(I+J)
 1620 A(I+J)=BLANK
 1650 CONTINUE
C LOOK FOR SEQGP CARD.
      IF(A(1).EQ.S.ANU.A(2).EQ.E.AND.A(3).EQ.Q.AND.A(4).EQ.G) IPARAM(7)=4
 1660 IF(A(1).EQ.1) GO TO 35
C LOOK FOR COMMENT CARD.
      IF(A(1).EQ.1) GO TO 35
C LOOK FOR ENDDATA CARD.
      I=0
 32 I=I+1
      IF(I.GT.75) GO TO 35
      IF(A(I).EQ.BLANK) GO TO 32
      IF(A(I).NE.L) GO TO 40
      IF(A(I+1).NE.N) GO TO 40
      IF(A(I+2).NE.D) GO TO 40
      IF(A(I+3).NE.J) GO TO 40
C LEFT-ADJUST ENDDATA CARD.
      K=73-I
      DO 33 J=1,72
      IF(J.LE.K) A(J)=A(J+I-1)
 33 IF(J.GT.K) A(J)=BLANK
      WRITE(6,NOJT,1J) A
      RETURN
 35 WRITE(6,NOJT,1J) A
      GO TO 30
C DETERMINE IF CARD IS TO BE PROCESSED.
 40 IF(KA.EQ.1) GO TO 150
      IF(A(1).EQ.C.OR.A(1).EQ.G) GO TO 150
      IF(A(1).EQ.M.AND.A(2).EQ.P) GO TO 150
      NCOL=9
      IF(A(1).EQ.ASTER) GO TO 50
      GOOGA158      801
      GOOGA159      802
      GOOGA160      803
      GOOGA161      804
      GOOGA162      805
      GOOGA163      806
      GOOGA164      807
      GOOGA165      808
      GOOGA166      809
      GOOGA167      810
      GOOGA168      811
      GOOGA169      812
      GOOGA170      813
      GOOGA171      814
      GOOGA172      815
      GOOGA173      816
      GOOGA174      817
      GOOGA175      818
      GOOGA176      819
      GOOGA177      820
      GOOGA178      821
      GOOGA179      822
      GOOGA180      823
      GOOGA181      824
      GOOGA182      825
      GOOGA183      826
      GOOGA184      827
      GOOGA185      828
      GOOGA186      829
      GOOGA187      830
      GOOGA188      831
      GOOGA189      832
      GOOGA190      833
      GOOGA191      834
      GOOGA192      835
      GOOGA193      836
      GOOGA194      837
      GOOGA195      838
      GOOGA196      839
      GOOGA197      840
      GOOGA198      841
      GOOGA199      842
      GOOGA200      843
      GOOGA201      844
      GOOGA202      845
      GOOGA203      846
      GOOGA204      847
      GOOGA205      848
      GOOGA206      849
      GOOGA207      850
      GOOGA208      851
      GOOGA209      852
      GOOGA210      853
      GOOGA211      854
      GOOGA212      855
      GOOGA213      856
      GOOGA214      857
      GOOGA215      858
      GOOGA216      859
      GOOGA217      860
      GOOGA218      861
      GOOGA219      862
      GOOGA220      863
      GOOGA221      864
      GOOGA222      865
      GOOGA223      866
      GOOGA224      867
      GOOGA225      868
      GOOGA226      869
      GOOGA227      870
      GOOGA228      871
      GOOGA229      872
      GOOGA230      873
      GOOGA231      874
      GOOGA232      875
      GOOGA233      876
      GOOGA234      877
      GOOGA235      878
      GOOGA236      879
      GOOGA237      880
      GOOGA238      881
      GOOGA239      882
      GOOGA240      883
      GOOGA241      884
      GOOGA242      885
      GOOGA243      886
      GOOGA244      887
      GOOGA245      888
      GOOGA246      889
      GOOGA247      890
      GOOGA248      891
      GOOGA249      892
      GOOGA250      893
      GOOGA251      894
      GOOGA252      895
      GOOGA253      896
      GOOGA254      897
      GOOGA255      898
      GOOGA256      899
      GOOGA257      900

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      IF(A(1).EQ.PLUS) GO TO 60
      GO TO 30
  50 NCOL=16
  60 NFIELD=64/NCOL
      I=0
  70 I=I+1
      IF(I.GT.NFIELD) GO TO 150
      IPROC=0
      IFLAG=0
      J=0
  80 J=J+1
      IF(IPROC.EQ.1) GO TO 70
      IF(J.LE.NCOL) GO TO 90
      IF(IFLAG.EQ.1) GO TO 30
      GO TO 70
  90 ICOL=8+NCOL*(I-1)+J
      IF(A(ICOL).EQ.BLANK) GO TO 80
      IFLAG=1
      DO 100 L=1,10
 100 IF(A(ICOL).EQ.ANUM(L)) IPROC=1
      GO TO 80
C PROCESS FIRST FIELD.
 150 NCOL=8
      KAST=8
      KBLK=8
      DO 160 I=1,8
      IF(A(I).NE.BLANK.AND.A(I).NE.ASTER.AND.A(I+1).EQ.BLANK) KBLK=I+1
      IF(A(I).EQ.ASTER)KAST=1
 160 IF(A(I).EQ.ASTER)NCOL=16
      IF(A(1).EQ.PLUS)NCOL=8
      IF(NCOL.EQ.16) GO TO 170
      IF(KBLK.EQ.2) GO TO 200
      IF(A(1).NE.PLUS)A(KBLK)=ASTER
      IF(A(1).EQ.PLUS)A(1)=ASTER
      GO TO 200
 170 IF(A(1).EQ.ASTER) GO TO 200
      IA=MIN0(KAST,KBLK)
      IB=MAX0(KAST,KBLK)
      A(IB)=BLANK
      A(IA)=ASTER
C RIGHT-ADJUST ALL BULK DATA WHICH IS TO BE PROCESSED.
 200 NFIELD=64/NCOL
      IFIELD=0
 210 IFIELD=IFIELD+1
      IF(IFIELD.GT.NFIELD) GO TO 300
      I=0
 220 I=I+1
      IF(I.GT.NCOL) GO TO 210
      ICOL=9+NCOL*IFIELD-I
      IF(A(ICOL).EQ.BLANK) GO TO 220
      NBLANK=I-1
      NN=NCOL-NBLANK
      DO 230 I=1,NCOL
      J=9+NCOL*IFIELD-I
      JNB=J-NBLANK
      IF(I.LE.JNB)A(J)=A(JNB)
      IF(I.GT.JNB)A(J)=BLANK
 230 CONTINUE
      GO TO 210
C WRITE NEW CARD.
 300 IF(KB.EQ.1) A(73)=ASTER
      IF(NCOL.EQ.8.AND.KB.EQ.1) GO TO 310
      WRITE(NOUT,11)A
      GO TO 30
 310 WRITE(NOUT,11)(A(I),I=1,40),ICARD,ICARD,(A(I),I=41,80)
      GO TO 30
      END
      SUBROUTINE GRID(NGRID)
C PARTITION EXPANDABLE CORE.
      COMMON /BITS/ NBITIN,NBITEX
      COMMON /A/ MAXGRJ,MAXDEG
      COMMON /II/ II(7),KDR
      MAX=16584
      N=NGRID
      NBITIN = 60
      IF(N.LT.100) N=100
      IF(N.GT.MAX) GO TO 40
C CALCULATE WIDTH II(2) OF IG MATRIX.
 20  L=60/NBITIN
      M=60/NBITIN
      N=N*L*M-1
      N=N-MOD(N,L*M)
      MAXGRD=N
C I=PACKED LENGTH FOR INTERNAL NUMBER.
C J=PACKED LENGTH FOR ORIGINAL NUMBER.
      I=N/L
      J=N/M
C SET UP DIMENSIONS IN II A<RAY>, WHERE IG(II1,II2),INV(II3,2),
C INT(II4),ICG(II5),ILJ(II6),NORIG(II7)
      II(1)=1
      II(3)=2*J
      II(4)=J
      II(5)=J
      II(6)=J
      II(7)=J
      IZ=2*II(3)+II(4)+II(5)+II(6)+II(7)
      II(2)=(KDR-I)/(II(1)+2)
C DENOMINATOR CONTAINS A 2 TO ALLOW FOR 2 SCRATCH ARRAYS, EACH OF
C LENGTH MAXDEG.
      II(2)=I.40(II(2),N-1)

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      MAXDEG=II(2)
      RETURN
C SUBSTITUTE MAX IF NGRID TOO LARGE.
40      N=MAX
      WRITE(6,50) NGRID,N
50 FORMAT(23H1BANDIT WARNING MESSAGE/10X,6H$GRID ,I10,5X,
     + 9HTOO LARGE /10X,6H$GRID ,I10,5X,12HSUBSTITUTED. )
      GO TO 20
      END
      SUBROUTINE READIT(A,IP,NIP)
C THIS ROUTINE READS AND STORES (IN IP) NUMERIC DATA APPEARING ON
C $-CONTROL CARDS UP TO COLUMN 72.
      DIMENSION ANUM(10)
      DIMENSION A(1),IP(1)
      DATA ANUM/1H0,1H1,1H2,1H3,1H4,1H5,1H6,1H7,1H8,1H9/
C INITIALIZE ARRAY.
      NIP=0
      DO 10 I=1,40
10    IP(I)=0
      I=3
      DO 70 KOUNT=1,40
      NUM=0
      NUMFL=0
20    I=I+1
      IF(I.LE.72) GO TO 30
      IF(NUMFL.EQ.1) GO TO 60
      RETURN
30    K=99
      DO 40 J=1,10
40    IF(A(J).EQ.ANUM(J)) K=J-1
      IF(K.NE.99) GO TO 50
      IF(NUMFL) 60,20,60
50    NUMFL=1
      NUM=1.0*NJM+K
      GO TO 20
60    NIP=KOUNT
      IP(NIP)=NUM
70    CONTINUE
      NIP=40
      RETURN
      END
      SUBROUTINE BOMBIT(IERR)
C BOMB BANDIT TO SUPPRESS THE EXECUTION OF NASTRAN.
      COMMON /B/ IPARAM(20)
      COMMON /K/ II(7),KORE,IFL
3   FORMAT(43H1INSUFFICIENT CORE OR $GRID N CARD REQUIRED)
5   FORMAT(2UU(1H+,130X/))
      CALL REMARK40H *****
      GO TO (10,20,30,40,50,60,70,80,90), IERR
C EOF ENCOUNTERED.
10   WRITE(6,12)
12   FORMAT(5$H1BANDIT FATAL ERROR - MISSING BEGIN BULK OR ENDDATA,BOMBIT20
     + 6H CARD. )
      CALL REMARK39H **MISSING BEGIN BULK OR ENDDATA CARD )
      GO TO 500
C BULK DATA CARD OUT OF SORT.
20   CALL REMARK31H **BULK DATA CARD OUT OF SORT )
      GO TO 500
C SEQGP CARDS IN DECK AND RESEQUENCING REQUESTED.
30   CALL REMARK32H **SEQGP CARDS ALREADY IN DECK )
      GO TO 500
C $SCHEME ILLEGAL ARGUMENTS.
40   WRITE(6,42)
42   FORMAT(46H1BANDIT FATAL ERROR - ILLEGAL ARGUMENTS ON,
     + 14H $SCHEME CARD. )
      CALL REMARK30H **ILLEGAL $SCHEME ARGUMENTS )
      GO TO 500
C TOO MANY TERMS IN MPC EQUATION.
50   CALL REMARK36H **MPC EQUATION HAS TOO MANY TERMS )
      GO TO 500
C MAXDEG EXCEEDED.
60   CALL REMARK28H **MAXIMUM DEGREE EXCEEDED )
      WRITE(6,3)
      GO TO 500
C MAXGRO EXCEEDED.
70   CALL REMARK39H **MAX NUMBER OF GRID POINTS EXCEEDED )
      WRITE(6,3)
      GO TO 500
C NON-EXISTENT GRID POINT REFERENCE ON $-CARD
80   CALL REMARK32H **ILLEGAL REFERENCE ON $-CARD )
      GO TO 500
C TOO MANY GRID POINTS ON $-CARD.
90   WRITE(6,92)
92   FORMAT(51H1BANDIT FATAL ERROR - TOO MANY POINTS ON $-CARD)
      CALL REMARK30H **TOO MANY POINTS ON $-CARD )
      GO TO 500
C ABORT BANDIT.
500  CALL REMARK17H **BANDIT ABORT )
      CALL REMARK23H **NASTRAN SUPPRESSED )
      CALL REMARK40H *****
      WRITE(6,5)
      STOP
      END
      SUBROUTINE SCAT(KG,NCON,NEW,INV,II3,NORIG)
C THIS ROUTINE USES SCATTER SORT TECHNIQUES FOR EACH GRID POINT
C ENCOUNTERED TO DETERMINE WHETHER OR NOT THE POINT HAS
C BEEN SEEN BEFORE. IF NOT, INV, NORIG, AND NEW ARE UPDATED.
C INV(I,1) CONTAINS AN ORIGINAL GRID POINT NUMBER
C INV(I,2) CONTAINS THE INTERNAL NUMBER ASSIGNED TO IT (BEFORE SORTING)
      DIMENSION INV(II3,2),NORIG(1)
      SCAT  2   1094
      SCAT  3   1095
      SCAT  4   1096
      SCAT  5   1097
      SCAT  6   1098
      SCAT  7   1099
      SCAT  8   1100

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COMMON /A/ MAXGRD,MAXDEG,KMOD           SCAT   9    1101
DIMENSION KG(1)                         SCAT  10    1102
DO 100 I=1,NCON                         SCAT  11    1103
NOLD=KG(I)
IF(NOLD.EQ.0)GO TO 100
LOC=NOLD-1
10 LOC=MOD(LOC,KMOD)+1                 SCAT  12    1104
IF(INV(LOC,1).NE.0) GO TO 30
INV(LOC,1)=NOLD
NEW=NEW+1
IF(NEW.GT.MAXGRD) GO TO 150
NORIG(NEW)=NOLD
INV(LOC,2)=NEW
GO TO 40
30 IF(INV(LOC,1).NE.NOLD) GO TO 10
40 KG(I)=INV(LOC,2)
100 CONTINUE
RETURN
150 WRITE(6,160) MAXGRD
160 FORMAT(35H1 THIS STRUCTURE CONTAINS MORE THAN,I6,
        + 14H GRID POINTS. /14H FATAL ERROR. )
CALL DMBIT(7)
END
SUBROUTINE BRIGIT(IG,III1,INV,II3,INT,ICC,NORIG,IP)
C THIS ROUTINE GENERATES A NEW INTERNAL/EXTERNAL CORRESPONDENCE
C TABLE NORIG AND CONNECTION TABLE IG SUCH THAT THE NEW INTERNAL
C NUMBERS CORRESPOND TO A SORT OF THE ORIGINAL NUMBERS INTO
C ASCENDING ORDER.
C INPUT - IG,INV,NORIG
C OUTPUT - IG,NORIG,ICC
C SCRATCH - INT,IP
DIMENSION IG(III1,1),INV(II3,2)
DIMENSION INT(1),ICC(1),NORIG(1),IP(1)
COMMON /S/ NN,MM,IH,I3
COMMON /A/ MAXGRD,MAXDEG,KMOD,NMPC
COMMON /BITS/ NBITIN,NBITEX,IPASS
REWIND 8
C PERFORM A ROUGH SORT OF THE ORIGINAL GRID NUMBERS.
L=0
KFAC=-1
20 KFAC=KFAC+1
MIN=2147483647
DO 50 I=1,KMOD
IF(INV(I,1).GT.(KFAC*KMOD))
        + MIN=MIN0(MIN,INV(I,1))
50 CONTINUE
KFAC=(MIN-1)/KMOD
DO 80 I=1,KMOD
IS=INV(I,1)
IF(IS.LE.(KFAC*KMOD).OR.IS.GT.(KFAC+1)*KMOD) GO TO 80
L=L+1
INT(L)=INV(I,1)
80 CONTINUE
IF(L.LT.NN) GO TO 20
C COMPLETE THE SORTING OF THE ORIGINAL GRID NUMBERS.
CALL SORT(INT,NN)
C DETERMINE CORRESPONDENCE (ICC) BETWEEN NORIG AND INT ARRAYS.
DO 130 I=1,NN
L=INT(I)
LOC=L-1
110 LOC=MOD(LOC,KMOD)+1
120 IF(INV(LOC,1).NE.L) GO TO 110
M=INV(LOC,2)
ICC(M)=I
130 CONTINUE
C TRANSFER INT ARRAY TO NORIG ARRAY.
DO 220 I=1,NN
220 NORIG(I)=INT(I)
C CHANGE IG MATRIX ACCORDING TO CORRESPONDENCE TABLE ICC.
CALL SWITCH(IG,III1,INT,ICC,IP(1),IP(MAXDEG+1))
REWIND 6
RETURN
END
SUBROUTINE SORT(LIST,NL)
C THIS SUBROUTINE SORTS A LIST OF LENGTH NL AND IS BIASED TOWARDS THOSE
C LISTS NOT BADLY OUT OF SORT.
DIMENSION LIST(1)
IF(NL.LE.1) RETURN
NL1=NL-1
DO 20 I=1,NL1
K=NL-I
KFLAG=0
DO 10 J=1,K
IF(LIST(J).LE.LIST(J+1)) GO TO 10
KFLAG=1
L=LIST(J)
LIST(J)=LIST(J+1)
LIST(J+1)=L
10 CONTINUE
IF(KFLAG.EQ.0) RETURN
20 CONTINUE
RETURN
END
SUBROUTINE SETIG(KG1,KG2,IG,III1,NORIG)
C THIS ROUTINE SETS IG(KG1,-)=KG2 AND IG(KG2,-)=KG1 IF THIS
C CONNECTION HAS NOT ALREADY BEEN SET.
DIMENSION IG(III1,1),NORIG(1)
COMMON /S/ NN,MM,IH,I3
COMMON /A/ MAXGRD,MAXDEG,KMOD,NMPC
COMMON /BITS/ NBITIN,NBITEX,IPASS
SCAT   9    1101
SCAT  10    1102
SCAT  11    1103
SCAT  12    1104
SCAT  13    1105
SCAT  14    1106
SCAT  15    1107
SCAT  16    1108
SCAT  17    1109
SCAT  18    1110
SCAT  19    1111
SCAT  20    1112
SCAT  21    1113
SCAT  22    1114
SCAT  23    1115
SCAT  24    1116
SCAT  25    1117
SCAT  26    1118
SCAT  27    1119
SCAT  28    1120
SCAT  29    1121
SCAT  30    1122
SCAT  31    1123
BRIGIT 2   1124
BRIGIT 3   1125
BRIGIT 4   1126
BRIGIT 5   1127
BRIGIT 6   1128
BRIGIT 7   1129
BRIGIT 8   1130
BRIGIT 9   1131
BRIGIT10  1132
BRIGIT11  1133
BRIGIT12  1134
BRIGIT13  1135
BRIGIT14  1136
BRIGIT15  1137
BRIGIT16  1138
BRIGIT17  1139
BRIGIT18  1140
BRIGIT19  1141
BRIGIT20  1142
BRIGIT21  1143
BRIGIT22  1144
BRIGIT23  1145
BRIGIT24  1146
BRIGIT25  1147
BRIGIT26  1148
BRIGIT27  1149
BRIGIT28  1150
BRIGIT29  1151
BRIGIT30  1152
BRIGIT31  1153
BRIGIT32  1154
BRIGIT33  1155
BRIGIT34  1156
BRIGIT35  1157
BRIGIT36  1158
BRIGIT37  1159
BRIGIT38  1160
BRIGIT39  1161
BRIGIT40  1162
BRIGIT41  1163
BRIGIT42  1164
BRIGIT43  1165
BRIGIT44  1166
BRIGIT45  1167
BRIGIT46  1168
BRIGIT47  1169
BRIGIT48  1170
BRIGIT49  1171
BRIGIT50  1172
BRIGIT51  1173
SORT   2    1174
SORT   3    1175
SORT   4    1176
SORT   5    1177
SORT   6    1178
SORT   7    1179
SORT   8    1180
SORT   9    1181
SORT  10    1182
SORT  11    1183
SORT  12    1184
SORT  13    1185
SORT  14    1186
SORT  15    1187
SORT  16    1188
SORT  17    1189
SORT  18    1190
SORT  19    1191
SORT  20    1192
SORT  21    1193
SETIG  2    1194
SETIG  3    1195
SETIG  4    1196
SETIG  5    1197
SETIG  6    1198
SETIG  7    1199
SETIG  8    1200

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IF(KG1.EQ.0)RETURN
IF(KG2.EQ.0)RETURN
IF(KG1.EQ.KG2)RETURN
DO 50 LOOP=1,2
L=KG1
K=KG2
IF(LOOP.EQ.1) GO TO 20
L=KG2
K=KG1
20 M=0
30 M=M+1
IF(M.GT.MAXDEG) GO TO 60
IS = IG(L,M)
IF(IS.EQ.0) GO TO 40
IF(IS.NE.K) GO TO 30
GO TO 50
40 IG(L,M) = K
MM=MAX0(MM,M)
50 CONTINUE
RETURN
60 WRITE(6,70) NORIG(L),MAXDEG
70 FORMAT(12H1 GRID POINT,I12,26H HAS DEGREE GREATER THAN,16/
+ 14H FATAL ERROR. )
CALL BOMBIT(6)
END
SUBROUTINE TIGER(NEQ,IG,III,LIST,NORIG)
C THIS ROUTINE MAKES ADDITIONS TO THE CONNECTION TABLE IG TO REFLECT
C THE PRESENCE OF MPC'S AND STORES THE DEPENDENT POINTS IN LIST.
C NEQ=NUMBER OF MPC EQUATIONS.
DIMENSION IG(III,1),LIST(1),NORIG(1)
COMMON /S/ NN,MM,IH,I3
COMMON /A/ MAXGRD,MAXDEG,KMOD,NMPC
COMMON /BITS/ NBITIN,NBITEX,IPASS
DIMENSION KG(40)
IF(NEQ.LT.0)RETURN
REWIND 11
C INITIALIZE LIST.
DO 20 I=1,NN
20 LIST(I)=0
C GENERATE NEW CONNECTIONS.
DO 100 II=1,NEQ
READ(11)KG
IGRID=KG(1)
LIST(IGRID)=IGRID
DO 100 I=1,MAXDEG
L = IG(IGRID,I)
DO 100 J=2,NMPC
100 CALL SETIGIL(KG(J),IG,III,NORIG)
REWIND 11
RETURN
END
SUBROUTINE SWITCH(IG,III,IFLAG,KT,KA,KB)
C THIS SUBROUTINE GENERATES A NEW IG MATRIX ACCORDING TO THE
C CORRESPONDENCE TABLE KT, WHICH MUST BE SET UP
C PRIOR TO THE CALL. ONLY INTERNAL NUMBERS ARE ALLOWED
C AS VALUES OF KT.
C
C INPUT - IG,KT
C OUTPUT - IG
C SCRATCH - IFLAG,KA,KB
C
DIMENSION IG(III,1),IFLAG(1),KT(1),KA(1),KB(1)
COMMON /S/ NN,MM,IH,I3
COMMON /A/ MAXGRD,MAXDEG,KMOD,NMPC
COMMON /BITS/ NBITIN,NBITEX,IPASS
C KT=CORRESPONDENCE TABLE. KT(OLD) = NEW.
C KA,KB = TEMPORARY STORAGE ROWS.
DO 100 I=1,NN
DO 90 J=1,MM
L = IG(I,J)
IF(L.LE.0) GO TO 100
IS=KT(L)
IG(I,J) = IS
90 CONTINUE
100 CONTINUE
C INITIALIZE FLAGS.
DO 120 I=1,NN
120 IFLAG(I)=0
C INITIALIZE TEMPORARY STORAGE ROWS.
DO 130 I=1,MM
KA(I)=0
130 KB(I)=0
C RE-ORDER ROWS OF IG MATRIX.
DO 200 IROW=1,NN
IF(IFLAG(IROW).EQ.1) GO TO 200
IF(KT(IROW).EQ.IROW) GO TO 200
IFLAG(IROW)=1
DO 140 J=1,MM
140 KB(J) = IG(IROW,J)
L=KT(IROW)
150 IFLAG(L)=1
DO 160 J=1,MM
KA(J) = IG(L,J)
IG(L,J) = KB(J)
160 KB(J)=KA(J)
M=KT(L)
IF(IFLAG(M).EQ.1) GO TO 170
L=M
GO TO 150
170 DO 180 J=1,MM

```

SETIG 9	1201
SETIG 10	1202
SETIG 11	1203
SETIG 12	1204
SETIG 13	1205
SETIG 14	1206
SETIG 15	1207
SETIG 16	1208
SETIG 17	1209
SETIG 18	1210
SETIG 19	1211
SETIG 20	1212
JJ 24	1213
SETIG 22	1214
SETIG 23	1215
SETIG 24	1216
JJ 25	1217
SETIG 26	1218
SETIG 27	1219
SETIG 28	1220
SETIG 29	1221
SETIG 30	1222
SETIG 31	1223
SETIG 32	1224
SETIG 33	1225
TIGER 2	1226
TIGER 3	1227
TIGER 4	1228
TIGER 5	1229
TIGER 6	1230
TIGER 7	1231
TIGER 8	1232
TIGER 9	1233
TIGER 10	1234
TIGER 11	1235
TIGER 12	1236
TIGER 13	1237
TIGER 14	1238
TIGER 15	1239
TIGER 16	1240
TIGER 17	1241
TIGER 18	1242
TIGER 19	1243
TIGER 20	1244
TIGER 21	1245
JJ 26	1246
TIGER 23	1247
TIGER 24	1248
TIGER 25	1249
TIGER 26	1250
TIGER 27	1251
SWITCH 2	1252
SWITCH 3	1253
SWITCH 4	1254
SWITCH 5	1255
SWITCH 6	1256
SWITCH 7	1257
SWITCH 8	1258
SWITCH 9	1259
SWITCH10	1260
SWITCH11	1261
SWITCH12	1262
SWITCH13	1263
SWITCH14	1264
SWITCH15	1265
SWITCH16	1266
SWITCH17	1267
SWITCH18	1268
SWITCH19	1269
JJ 27	1270
SWITCH21	1271
SWITCH22	1272
JJ 28	1273
SWITCH24	1274
SWITCH25	1275
SWITCH26	1276
SWITCH27	1277
SWITCH28	1278
SWITCH29	1279
SWITCH30	1280
SWITCH31	1281
SWITCH32	1282
SWITCH33	1283
SWITCH34	1284
SWITCH35	1285
SWITCH36	1286
SWITCH37	1287
SWITCH38	1288
JJ 29	1289
SWITCH40	1290
SWITCH41	1291
SWITCH42	1292
JJ 30	1293
JJ 31	1294
SWITCH45	1295
SWITCH46	1296
SWITCH47	1297
SWITCH48	1298
SWITCH49	1299
SWITCH50	1300

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180 IG(M,J) = KB(J)
200 CONTINUE
    RETURN
END
SUBROUTINE MORRIS(LIST,NL,IG,III)
C THIS ROUTINE DELETES ALL REFERENCE IN THE CONNECTION TABLE IG
C TO THOSE POINTS IN A LIST OF LENGTH NL.
DIMENSION IG(III,1),LIST(1)
COMMON /S/ NN,NM
COMMON /A/ MAXRD
COMMON /BITS/ NBITIN,NBITEX
C COMPRESS OUT DUPLICATE ENTRIES IN LIST.
CALL FIXIT(LIST,NL)
IF(NL.LE.0) RETURN
MM1=MM-1
DO 60 IJ=1,NL
I=LIST(IJ)
DO 50 J=1,MM
L=IG(I,J)
IF(L.EQ.0) GO TO 60
K=0
20 K=K+1
M=IG(L,K)
IF(M.NE.I) GO TO 20
IF(K.GE.MM) GO TO 40
DO 30 N=K,MM1
IS=IG(L,N+1)
30 IG(L,N) = IS
40 IG(L,MM) = 0
IG (I,J) = U
50 CONTINUE
60 CONTINUE
RETURN
END
SUBROUTINE FIXIT(LIST,NL)
C THIS ROUTINE COMPRESSES OUT ZEROES AND MULTIPLE ENTRIES IN A LIST
C ORIGINALLY OF LENGTH NL. A CORRECTED LENGTH NL IS RETURNED TO
C THE CALLING PROGRAM.
DIMENSION LIST(1)
IF(NL.LE.0) RETURN
IF(NL.EQ.1) GO TO 110
NL1=NL-1
C DELETE DUPLICATE ENTRIES.
DO 20 I=1,NL1
IF(LIST(I).EQ.0) GO TO 20
I1=I+1
DO 10 J=I1,NL
IF(LIST(I).NE.LIST(J)) GO TO 10
LIST(I)=0
GO TO 20
10 CONTINUE
20 CONTINUE
C DELETE ZEROES.
DO 40 I=1,NL1
K=0
25 IF(LIST(I).NE.0) GO TO 40
K=K+1
DO 30 J=I,NL1
LIST(J)=LIST(J+1)
LIST(NL)=0
IF(K.GE.(NL-I+1)) GO TO 70
GO TO 25
40 CONTINUE
C CALCULATE NEW LENGTH NL.
70 DO 80 I=1,NL
J=NL-I+1
IF(LIST(J).NE.0) GO TO 90
80 CONTINUE
90 NL=NL-I+1
RETURN
110 IF(LIST(1).EQ.0) NL=0
RETURN
END
SUBROUTINE SCHEME(NT,NUM,NCM,IO,IP,IG,III,IC,IDE,G,IDS,IM,
+ NEW,ICC,ILD,IPP)
C IO IS VALID IFF 2.LE.IO.LE.3
DIMENSION IG(III,1),IC(1),IDE(G,1),IDS(1),IM(1)
DIMENSION NEW(1),ICC(1),ILD(1),IPP(1)
C IPP HAS DIMENSION 2*MAXDEG
COMMON /S/ NN,NM,IM,IB
COMMON /P/ IM0,IMH
COMMON /A/ MAXRD
COMMON /C/ IWARN,LINE,KURIG,KNEW
COMMON /BITS/ NJITIN,NBITEX,IPASS
COMMON /TIME/ STIME,NCM
COMMON /B/ IPARAM(20)
COMMON /DOL/ ISTART(100),IGNORE(100),IFIRST(100)
COMMON /DOL/ IDIM,ISTA,IIIG,IFIR
DIMENSION NODESL(100)
EQUIVALENCE (IM,ATIME)
C DETERMINE THE DEGREE OF EACH NODE.
CALL DEGRL(IG,III,IDE,G)
C DETERMINE MOJD, THE MOST PREVALENT NODAL DEGREE.
MOJD=MODE(IDE,G,IPP)
C DETERMINE THE NUMBER OF COMPONENTS, NCM.
NCM=COMPNT(IG,III,IC,IDE,G,IM,ICC)
C DETERMINE THE MAXIMUM DEGREE OF ANY NODE.
MAXD=MAXDGR(0,IC,IDE,G)
MAX=MAXD
C DETERMINE THE ORIGINAL BANDWIDTH,IS.
JJ      32      1301
SWITCH52   1302
SWITCH53   1303
SWITCH54   1304
MORRIS 2    1305
MORRIS 3    1306
MORRIS 4    1307
MORRIS 5    1308
MORRIS 6    1309
MORRIS 7    1310
MORRIS 8    1311
MORRIS 9    1312
MORRIS10   1313
MORRIS11   1314
MORRIS12   1315
MORRIS13   1316
MORRIS14   1317
MORRIS15   1318
JJ      33      1319
MORRIS17   1320
MORRIS18   1321
MORRIS19   1322
JJ      34      1323
MORRIS21   1324
MORRIS22   1325
MORRIS23   1326
JJ      35      1327
JJ      36      1328
JJ      37      1329
MORRIS28   1331
MORRIS29   1332
MORRIS30   1333
MORRIS31   1334
FIXIT 2    1335
FIXIT 3    1336
FIXIT 4    1337
FIXIT 5    1338
FIXIT 6    1339
FIXIT 7    1340
FIXIT 8    1341
FIXIT 9    1342
FIXIT 10   1343
FIXIT 11   1344
FIXIT 12   1345
FIXIT 13   1346
FIXIT 14   1347
FIXIT 15   1348
FIXIT 16   1349
FIXIT 17   1350
FIXIT 18   1351
FIXIT 19   1352
FIXIT 20   1353
FIXIT 21   1354
FIXIT 22   1355
FIXIT 23   1356
FIXIT 24   1357
FIXIT 25   1358
FIXIT 26   1359
FIXIT 27   1360
FIXIT 28   1361
FIXIT 29   1362
FIXIT 30   1363
FIXIT 31   1364
FIXIT 32   1365
FIXIT 33   1366
FIXIT 34   1367
FIXIT 35   1368
FIXIT 36   1369
FIXIT 37   1370
FIXIT 38   1371
FIXIT 39   1372
FIXIT 40   1373
SCHEME 2   1374
SCHEME 3   1375
SCHEME 4   1376
SCHEME 5   1377
SCHEME 6   1378
SCHEME 7   1379
SCHEME 8   1380
SCHEME 9   1381
SCHEME10   1382
SCHEME11   1383
SCHEME12   1384
SCHEME13   1385
SCHEME14   1386
SCHEME15   1387
SCHEME16   1388
SCHEME17   1389
SCHEME18   1390
SCHEME19   1391
SCHEME20   1392
SCHEME21   1393
SCHEME22   1394
SCHEME23   1395
SCHEME24   1396
SCHEME25   1397
SCHEME26   1398
SCHEME27   1399
SCHEME28   1400

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DO 30 I=1,NN          SCHEME29   1401
NEW(I)=I             SCHEME30   1402
30 ILD(I)=I           SCHEME31   1403
IS=MAXBNJ(0,IG,III,IC,IDEGR,NEW,ILD)  SCHEME32   1404
KORIG=IS             SCHEME33   1405
IH0=IH               SCHEME34   1406
C INITIALIZE NEW AND ILD ARRAYS.    SCHEME35   1407
DO 35 I=1,NN           SCHEME36   1408
NEW(I)=0              SCHEME37   1409
35 ILD(I)=0           SCHEME38   1410
C IF IP IS NOT EQUAL TO 0, THEN PRINT COMPONENT NUMBER,DEGREE,
C AND CONNECTIONS FOR EACH NODE.     SCHEME39   1411
C IF(IP.EQ.0) GO TO 31            SCHEME40   1412
C PRINT INTERNAL NUMBER CONNECTION TABLE.  SCHEME41   1413
DO 60 I=1,NN           SCHEME42   1414
IF(MOD(I,LINE).EQ.1)WRITE(6,19)      SCHEME43   1415
19 FORMAT(3H1LABEL COMP MDIST DEGR CONNECTIONS ,10X,
1 18H(INTERNAL NUMBERS) )          SCHEME44   1416
MDIST=0                  SCHEME45   1417
DO 65 J=1,MAXD           SCHEME46   1418
IS1 = IG(I,J)            SCHEME47   1419
IF(IS1.LT.0)GO TO 65       SCHEME48   1420
MDIST=MAX0(MDIST,IABS(I-IS1))     JJ 39   1421
65 CONTINUE               SCHEME50   1422
IPP(1)=IC(I)              SCHEME51   1423
IPP(2)=IDEGR(I)           SCHEME52   1424
DO 61 J IP1=1,MAXD        SCHEME53   1425
61 IPP (IP1+2) = IG(I,IP1)  SCHEME54   1426
IS1=MAXU+2                SCHEME55   1427
60 WRITE(6,61) I,IPP(1),MDIST,(IPP(J),J=2,IS1)  JJ 40   1428
SCHEME56   1429
61 FORMAT(5I6,20I5/ 25(25X,2I5/))
WRITE(6,700)               SCHEME57   1430
700 FORMAT(1H1,//,32X,31HPROGRAMMER INFORMATION MESSAGES /)
WRITE(6,29) IS,IH          SCHEME58   1431
29 FORMAT(19H ORIGINAL BANDWIDTH,I7,10H PROFILE,I10)  SCHEME59   1432
WRITE(6,27) MODO           SCHEME60   1433
27 FORMAT(3DH MODE OF DEGREE DISTRIBUTION =,I5)      SCHEME61   1434
IF(ISTA.LE.0) GO TO 31        SCHEME62   1435
WRITE(6,701)               SCHEME63   1436
701 FORMAT(34H STARTING NODES SUPPLIED BY USER -)
WRITE(6,100) (ISTART(I),I=1,ISTA)  SCHEME64   1437
31 CONTINUE               SCHEME65   1438
IF(IO.EQ.3) IS=IH          SCHEME66   1439
C GENERATE NUMBERING SCHEME FOR EACH COMPONENT, NC.  SCHEME67   1440
DO 500 NC=1,NC             SCHEME68   1441
C DETERMINE THE RANGE OF DEGREES (MI TO MAD) OF NODES OF INTEREST. SCHEME69   1442
MI=MINDEG(NC,IC,IDEGR)     JJ 41   1443
MAD=MI                   SCHEME70   1444
IF(NOM) 90,87,90           SCHEME71   1445
90 MAD=MAXDGR(NC,IC,IDEGR)  SCHEME72   1446
MAD=MI*((MA-MI)*NUM)/NOM  SCHEME73   1447
C MAKE SURE THAT MAD IS LESS THAN MODO.  SCHEME74   1448
MAD=MIND(MAD,MODO-1)      SCHEME75   1449
MAD=MAX0(MAD,MI)          SCHEME76   1450
C DETERMINE BANDWIDTH OR SUM CRITERION FOR EACH NODE MEETING SPECI- SCHEME77   1451
C FIED CONDITION.          SCHEME78   1452
87 IF(IP.EQ.0) GO TO 91    SCHEME79   1453
WRITE(6,162) NC             SCHEME80   1454
162 FORMAT(22H ***** COMPONENT,I5,12H *****)  SCHEME81   1455
IFI(O.EQ.2) WRITE(6,169)    SCHEME82   1456
169 FORMAT(43H OPTION 2 SELECTED (CRITERION - BANDWIDTH ,
+ 57HMINIMIZATION; CONDITION - MINMAX NUMBER OF NODES/LEVEL) )
IFI(O.EQ.3) WRITE(6,179)    SCHEME83   1457
179 FORMAT(52H OPTION 3 SELECTED (CRITERION - MINIMIZATION OF SUM|,
+ 44H CONDITION - MINMAX NUMBER OF NODES/LEVEL) )
91 CALL DIAM(NC,MAD,NL,NOESEL,MAXLEV,IG,III,IC,IDEGR,DIS,IM,ICC)
IFI(P.EQ.0) GO TO 67        SCHEME84   1458
WRITE(6,39) NC,MAD          SCHEME85   1459
WRITE(6,59) MAXLEV         SCHEME86   1460
WRITE(6,100) (NOESEL(J),J=1,NL)  SCHEME87   1461
67 CONTINUE               SCHEME88   1462
IF(ISTA.LE.0) GO TO 760    SCHEME89   1463
M=0                      SCHEME90   1464
DO 750 I=1,ISTA           SCHEME91   1465
J=ISTART(I)              SCHEME92   1466
IFI(IC(J).NE.NC) GO TO 750 SCHEME93   1467
M=M+1                    SCHEME94   1468
DO 755 K=1,99             SCHEME95   1469
L=101-K                  SCHEME96   1470
755 NOESEL(L)=NOESEL(L-1)  SCHEME97   1471
NOESEL(1)=J               SCHEME98   1472
750 CONTINUE               SCHEME99   1473
NL=MIND(NL+M,100)          SCHEME100  1474
CALL FIXIT(NOESEL,NL)      SCHEME101  1475
760 CONTINUE               SCHEME102  1476
IFI(P.EQ.0) GO TO 63        SCHEME103  1477
IFI(ISTA.LE.0) GO TO 63    SCHEME104  1478
WRITE(6,730)               SCHEME105  1479
730 FORMAT(48H MERGED LIST OF STARTING NODES SUPPLIED BY USER ,
+ 15HAND BY BANDIT -)
WRITE(6,100) (NOESEL(I),I=1,NL)  SCHEME106  1480
39 FORMAT(10H COMPONENT,I5,19H MAX DEGREE' USED,I5)  SCHEME107  1481
59 FORMAT(52H STARTING NODES FOR MINMAX NUMBER OF NODES PER LEVEL,I5) SCHEME108  1482
100 FORMAT(4X,20I5)          SCHEME109  1483
63 CONTINUE               SCHEME110  1484
JMAX=MIND(NT,NL)           SCHEME111  1485
IM=9000000000               SCHEME112  1486
IMM=IM                     SCHEME113  1487
DO 400 J=1,JMAX            SCHEME114  1488
CALL RELABL(1,NOESEL(J ),IG,III,IC,IDEGR,DIS,IM,NEW,ICC,ILD)  SCHEME115  1489
SCHEME116  1490
SCHEME117  1491
SCHEME118  1492
SCHEME119  1493
SCHEME120  1494
SCHEME121  1495
SCHEME122  1496
SCHEME123  1497
SCHEME124  1498
SCHEME125  1499
SCHEME126  1500

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IB=MAXBNJ(IG,II1,IC,IDEGL,NEW,ILD)
IF(IP.NE.0) WRITE(6,69) NODESL(J),IB,IH
69 FORMAT(14H STARTING NODE, I6,4X,9HBANDWIDTH,I6,3X,7HPROFILE, I8)
IF(IO.EQ.3) IB=IH
IE=ICC(NC+1)-1
IF(IM-IB) 400,350,300
300 IM=IB
IMM=IH
IJ=J
GO TO 400
350 IF(IMM.LE.IH) GO TO 400
IMM=IH
IJ=J
400 CONTINUE
CALL RELABL(1,NODESL(IJ),IG,II1,IC,IDEGL,ILDIS,IW,NEW,ICC,ILD)
500 CONTINUE
CALL STACK(IDEGL,NEW,ILD,IW)
IB=MAXBNJ(IG,II1,IC,IDEGL,NEW,ILD)
IF(IP.EQ.0) GO TO 710
WRITE(6,705)
705 FORMAT(21H ORIGINAL LABELING -)
WRITE(6,708) KORIG,IHO
WRITE(6,707)
707 FORMAT(21H STU CM RELABELING -)
WRITE(6,708) IB,IH
708 FORMAT(1H#,2BX,9HBANDWIDTH,I7,10X,7HPROFILE, I10)
709 FORMAT(21H REV CM RELABELING -)
710 IF(IO.EQ.3) IB=IH
C PROFILE = SU4 CRIT
C IS=ORIGINAL BANDWIDTH (OR SUM CRIT IF IO.EQ.3)
C IB=CURRENT BANDWIDTH (OR SUM CRIT IF IO.EQ.3)
C IH=CURRENT PROFILE, IH0=ORIGINAL PROFILE
    IF(IB-IS) 715,742,744
742 IF(IH.LT.IH0) GO TO 715
744 DO 712 I=1,NN
    ILD(I)=I
712 NEW(I)=I
    CALL STACK(IDEGL,NEW,ILD,IW)
    IB=IS
    IH=IH0
    IF(IP.EQ.0) GO TO 715
    WRITE(6,713)
713 FORMAT(21H ORIG CM RELABELING -)
    WRITE(6,708) IB,IH
715 IHE=IH
    CALL REVERS(NEW,ILD)
    IB=MAXBNJ(IG,II1,IC,IDEGL,NEW,ILD)
    IF(IP.EQ.0) GO TO 717
    WRITE(6,709)
    WRITE(6,708) IH,IH
717 IF(IH.LT.IHE) GO TO 720
    CALL REVERS(NEW,ILD)
    IB=MAXBNJ(IG,II1,IC,IDEGL,NEW,ILD)
720 IHE=IH
    KNEW=IB
    IF(IP.EQ.0) GO TO 508
    WRITE(6,722)
722 FORMAT(21H ** FINAL LABELING -)
    WRITE(6,708) KNEW,IHE
503 CONTINUE
600 RETURN
END
SUBROUTINE STACK(IDEGL,NEW,ILD,IW)
C STACK POINTS OF ZERO DEGREE AT END OF THE NUMBERING.
DIMENSION IDEG(1),NEW(1),ILD(1),IW(1)
C IW IS SCRATCH STORAGE.
COMMON /S/ NN
COMMON /ZERO/ KT
KT=0
NN1=NN-1
C LIST POINTS OF ZERO DEGREE AND INCREMENT COUNTER KT.
DO 10 I=1,NN
IF(IDEGL(I).GT.0) GO TO 10
KT=KT+1
IW(KT)=ILD(I)
10 CONTINUE
IF(KT.LE.0) GO TO 70
C SORT LIST OF RENUMBERED NUMBERS TO BE STACKED.
CALL SORT(IW,KT)
C STACK POINTS OF ZERO DEGREE AT END OF NEW.
DO 40 L=1,KT
I=IW(L)-L+1
K=NEW(I)
IF(I.GE.NN) GO TO 30
DO 20 J=I,NN1
20 NEW(J)=NEW(J+1)
30 NEW(NN)=K
40 CONTINUE
C CORRECT ILD, THE INVERSE OF NEW.
70 DO 80 I=1,NN
K=NEW(I)
80 ILD(K)=I
RETURN
END
SUBROUTINE REVERS(NEW,ILD)
C REVERSE THE NUMBERING OF THE FIRST NN-KT GRID POINTS.
C NN=NUMBER OF GRID POINTS.
C KT=THE NUMBER OF POINTS OF ZERO DEGREE (STACKED AT END OF NEW
C BY STACK)
DIMENSION NEW(1),ILD(1)

SCHEM130 1501
SCHEM131 1502
SCHEM132 1503
SCHEM133 1504
SCHEM134 1505
SCHEM135 1506
SCHEM136 1507
SCHEM137 1508
SCHEM138 1509
SCHEM139 1510
SCHEM140 1511
SCHEM141 1512
SCHEM142 1513
SCHEM143 1514
SCHEM144 1515
SCHEM145 1516
SCHEM146 1517
SCHEM147 1518
SCHEM148 1519
SCHEM149 1520
SCHEM150 1521
SCHEM151 1522
SCHEM152 1523
SCHEM153 1524
SCHEM154 1525
SCHEM155 1526
SCHEM156 1527
SCHEM157 1528
SCHEM158 1529
SCHEM159 1530
SCHEM160 1531
SCHEM161 1532
SCHEM162 1533
SCHEM163 1534
SCHEM164 1535
SCHEM165 1536
SCHEM166 1537
SCHEM167 1538
SCHEM168 1539
SCHEM169 1540
SCHEM170 1541
SCHEM171 1542
SCHEM172 1543
SCHEM173 1544
SCHEM174 1545
SCHEM175 1546
SCHEM176 1547
SCHEM177 1548
SCHEM178 1549
SCHEM179 1550
SCHEM180 1551
SCHEM181 1552
SCHEM182 1553
SCHEM183 1554
SCHEM184 1555
SCHEM185 1556
SCHEM186 1557
SCHEM187 1558
SCHEM188 1559
JJ = 42 1560
SCHEM190 1561
SCHEM195 1562
STACK 2 1563
STACK 3 1564
STACK 4 1565
STACK 5 1566
STACK 6 1567
STACK 7 1568
STACK 8 1569
STACK 9 1570
STACK 10 1571
STACK 11 1572
STACK 12 1573
STACK 13 1574
STACK 14 1575
STACK 15 1576
STACK 16 1577
STACK 17 1578
STACK 18 1579
STACK 19 1580
STACK 20 1581
STACK 21 1582
STACK 22 1583
STACK 23 1584
STACK 24 1585
STACK 25 1586
STACK 26 1587
STACK 27 1588
STACK 28 1589
STACK 29 1590
STACK 30 1591
STACK 31 1592
STACK 32 1593
STACK 33 1594
REVERS 2 1595
REVERS 3 1596
REVERS 4 1597
REVERS 5 1598
REVERS 6 1599
REVERS 7 1600

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COMMON /S/ NN
COMMON /ZERO/ KT
C REVERSE NEW ARRAYS.
J=(NN-KT)/2
LL=NN-KT+1
DO 10 I=1,J
L=LL-I
K=NEW(I)
NEW(I)=NEW(L)
10 NEW(I)=K
L CORREC' ILD, THE INVERSE OF NEW.
 00 20 J=1,NN
  K=NEW(I)
  20 ILD(K)=I
  RETURN
END
SUBROUTINE DEGREE(IG,III,IUEG)
C SET UP THE IDEG ARRAY CONTAINING THE DEGREE OF EACH NODE STORED
C IN THE IG ARRAY.
C IDEG(I)=DEGREE OF NODE I
  DIMENSION I0,I(III,1),IDEGL(1)
  COMMON /S/ NN,MM,IM,IB
  COMMON /A/ MAXGRD
  COMMON /BITS/ NBITIN,NBITEX,IPASS
  DO 100 I=1,NN
  IDEG(I)=0
  DO 80 J=1,MM
  IF(IG(I,J)) 100,100,50
  50 IDEG(I)=IDEG(I)+1
  80 CONTINUE
100 CONTINUE
  RETURN
END
FUNCTION MODE(IDEGL,MM)
C COMPUTE MODE, THE MOST PREVALENT NODAL DEGREE.  IF SEVERAL DEGREES
C ARE EQUALLY PREVALENT, THE LOWEST IS CHOSEN.
  COMMON /S/ NN,MM
  DIMENSION IUEG(1),M00U(1)
C IDEG(I)=DEGREE OF NODE I
C M00U(I)=NUMBER OF NODES OF DEGREE I
  DO 10 I=1,MM
  M00U(I)=0
  DO 20 I=1,MM
  K=IDEGL(I)
  20 M00U(K)=M00U(K)+1
  MODE=0
  MAX=0
  DO 30 I=1,MM
  K=M00U(I)
  IF(K,LL,MAX) 50 TO 30
  MAX=K
  MODE=1
  30 CONTINUE
  RETURN
END
FUNCTION COMPNT(IG,III,IC,IDEGL,IW,ICC)
C THIS FUNCTION HAS AS ITS VALUE THE NUMBER OF COMPONENTS STORED
C IN THE CONNECTION ARRAY IC.
C ALSO, IC AND ICC ARE SET UP.
C IJ(I)=COMPONENT INDEX FOR NODE I
C ICC(I)=THE STARTING POSITION TO BE USED FOR LABELS IN COMPONENT I
C THUS, ICC(I+1)-ICC(I)=THE NUMBER OF NODES IN COMPONENT I
  DIMENSION I0(III,1),O(1),IUEG(1),IW(1),ICC(1)
  COMMON /S/ NN,MM,IM,IB
  COMMON /A/ MAXGRD
  COMMON /BITS/ NBITIN,NBITEX,IPASS
C INITIALIZE ARRAYS.
  DO 100 I=1,NN
  ICC(I)=0
  IC(I)=0
100 CONTINUE
  NC=0
  ICC(1)=1
C CHECK IF IC IS COMPLETE.
  100 DO 110 I=1,NN
  IF(IC(I)) 110,120,110
  110 COMPNT=NC
  RETURN
  120 NC=NC+1
  KI=0
  KO=1
  IW(1)=I
  IC(I)=NC
  IF(NC>1) 130,125,125
125  IS=ICC(NC)+1
  ICC(NC+1)=IS
  130 KI=KI+1
  II=IW(KI)
  N=IDEGL(II)
  IF(N>140) 140,105,140
140  UO 200 I=1,N
  IA = IG(II,I)
  IF(IC(IA)) 200,150,240
  150  IC(IA)=NC
  KU=KO+1
  IW(KO)=IA
  IS=ICC(NC+1)+1
  ICC(NC+1)=IS
200 CONTINUE
  IF(KO-KI) 105,105,130

```

REVERS 8	1601
REVERS 9	1602
REVERS10	1603
REVERS11	1604
REVERS12	1605
REVERS13	1606
REVERS14	1607
REVERS15	1608
REVERS16	1609
REVERS17	1610
REVERS18	1611
REVERS19	1612
REVERS20	1613
REVERS21	1614
REVERS22	1615
REVERS23	1616
DEGREE 2	1617
DEGREE 3	1618
DEGREE 4	1619
DEGREE 5	1620
DEGREE 6	1621
DEGREE 7	1622
DEGREE 8	1623
DEGREE 9	1624
DEGREE10	1625
DEGREE11	1626
DEGREE12	1627
JJ 43	1628
DEGREE14	1629
DEGREE15	1630
DEGREE16	1631
DEGREE17	1632
DEGREE18	1633
MODE 2	1634
MODE 3	1635
MODE 4	1636
MODE 5	1637
MODE 6	1638
MODE 7	1639
MODE 8	1640
MODE 9	1641
MODE 10	1642
MODE 11	1643
MODE 12	1644
MODE 13	1645
MODE 14	1646
MODE 15	1647
MODE 16	1648
MODE 17	1649
MODE 18	1650
MODE 19	1651
MODE 20	1652
MODE 21	1653
MODE 22	1654
MODE 23	1655
COMPNT 2	1656
COMPNT 3	1657
COMPNT 4	1658
COMPNT 5	1659
COMPNT 6	1660
COMPNT 7	1661
COMPNT 8	1662
COMPNT 9	1663
COMPNT10	1664
COMPNT11	1665
COMPNT12	1666
COMPNT13	1667
COMPNT14	1668
COMPNT15	1669
COMPNT16	1670
COMPNT17	1671
COMPNT18	1672
COMPNT19	1673
COMPNT20	1674
COMPNT21	1675
COMPNT22	1676
COMPNT23	1677
COMPNT24	1678
COMPNT25	1679
COMPNT26	1680
COMPNT27	1681
COMPNT28	1682
COMPNT29	1683
COMPNT30	1684
COMPNT31	1685
COMPNT32	1686
COMPNT33	1687
COMPNT34	1688
COMPNT35	1689
COMPNT36	1690
COMPNT37	1691
JJ 44	1692
COMPNT38	1693
COMPNT40	1694
COMPNT41	1695
COMPNT42	1696
COMPNT43	1697
COMPNT44	1698
COMPNT45	1699
COMPNT46	1700

```

      END
      FUNCTION MAXDGR(NC,IC,IDEGL)
C THIS FUNCTION HAS AS ITS VALUE THE MAXIMUM DEGREE OF ANY NODE OF
C   COMPONENT NC IF NC.GT.0
C IF NC.LE.0, ALL COMPONENTS ARE CONSIDERED.
      DIMENSION IC(1),IDEGL(1)
      COMMON /S/ NN,MM,IH,IB
      M=0
      DO 100 I=1,NN
      IF(NC)=0,50,40
      40  IF(IC(I)-NC) 100,50,100
      50  IF(IDEGL(I)-M) 100,100,60
      60  M=IDEGL(I)
      100 CONTINUE
      MAXDGR=M
      RETURN
      END
      FUNCTION MAXBND(NC,IG,III,IC,IDEGL,NEW,ILD)
C THIS FUNCTION HAS AS ITS VALUE THE MAXIMUM DIFFERENCE BETWEEN NODE
C   LABELS OF CONNECTED NODES FOR NODES OF COMPONENT NC.GT.0
C IF NC.LE.0, ALL COMPONENTS ARE CONSIDERED.
C THE NODAL RENUMBERING DEFINED BY ILD AND NEW MUST BE SET UP PRIOR
C   TO THE FUNCTION CALL.
C COMPUTE IH, THE SUM CRIT (PROFILE).
      DIMENSION IG(III,1),IC(1),IDEGL(1),NEW(1),ILD(1)
      COMMON /S/ NN,MM,IH,IB
      COMMON /A/ MAXGRD
      COMMON /BITS/ NBITIN,NBITEX,IPASS
      IH=0
      M=0
      DO 103 I=1,NN
      MX=0
      IA=NEW(I)
      IF(NC)=0,50,40
      40  IF(IA.LT.0) GO TO 100
      IF(NC-IC(IA)) 100,50,100
      50  N=IDEGL(IA)
      IF(N) 100,100,150
      150 DO 90 J=1,N
      II = IG(IA,J)
      IB=MAXU(J,I-ILD(II))
      IF(IB.GT.MX) MX=IB
      90  CONTINUE
      IF(MX.GT.M) M=MX
      IH=IH+MX
      100 CONTINUE
      MAXBND=M
      RETURN
      END
      FUNCTION MINDEG(NC,IC,IDEGL)
C THIS FUNCTION HAS AS ITS VALUE THE MINIMUM DEGREE OF ANY NODE OF
C   COMPONENT NC IF NC.GT.0
C IF NC.LE.0, ALL COMPONENTS ARE CONSIDERED.
      DIMENSION IC(1),IDEGL(1)
      COMMON /S/ NN,MM,IH,IB
      M=10000
      DO 100 I=1,NN
      IF(NC)=0,50,40
      40  IF(IC(I)-NC) 100,50,100
      50  IF(M-IDEGL(I)) 100,100,0
      60  M=IDEGL(I)
      100 CONTINUE
      MINDEG=M
      RETURN
      END
      SUBROUTINE DIAM(NC,MAXDEG,NL,NODESL,MAXLEV,
      + IG,III,IC,IDEGL,IOIS,IW,ICC)
C DETERMINE NL STARTING POINTS AND STORE IN NODESL.
      DIMENSION IG(III,1),IOIS(1),IW(1),ICC(1),IC(1),IDEGL(1)
      COMMON /S/ NN,MM,IH,IB
      COMMON /A/ MAXGRD
      COMMON /BITS/ NBITIN,NBITEX,IPASS
      DIMENSION NODESL(1)
      NL=0
      MAXLEV=10000
      DO 100 I=1,NN
      IF(NC-IC(I)) 100,40,100
      40  IF(MAXDEG-IDEGL(I)) 100,105,105
      105 MD=IOIST(I,ML,MAXLEV,IG,III,IC,IDEGL,IOIS,IW,ICC)
      IF(MD) 115,115,56
      56  IF(ML-MAXLEV)>50,84,10J
      58  MAXLEV=ML
      NL=1
      NODESL(1)=I
      GO TO 100
      64  IF(NL.GE.100) GO TO 100
      NL=NL+1
      NODESL(NL)=I
      100 CONTINUE
      110 RETURN
      115 ML=1
      NODESL(1)=I
      MAXLEV=0
      RETURN
      END
      SUBROUTINE RELABL(NS,NODES,IG,III,IC,IDEGL,IUIS,IW,NEW,ICC,ILD)
C GENERATE A RELABELING SCHEME STARTING WITH NS NODES FOR WHICH
C   LABELS HAVE BEEN STORED IN ARRAY NODES.
C SET UP ILD AND NEW.
C   ILD(OLD)=NEW
      RELABL 1    1701
      RELABL 2    1702
      RELABL 3    1703
      RELABL 4    1704
      RELABL 5    1705
      RELABL 6    1706
      RELABL 7    1707
      RELABL 8    1708
      RELABL 9    1709
      RELABL 10   1710
      RELABL 11   1711
      RELABL 12   1712
      RELABL 13   1713
      RELABL 14   1714
      RELABL 15   1715
      RELABL 16   1716
      RELABL 17   1717
      MAXBND 2    1718
      MAXBND 3    1719
      MAXBND 4    1720
      MAXBND 5    1721
      MAXBND 6    1722
      MAXBND 7    1723
      MAXBND 8    1724
      MAXBND 9    1725
      MAXBND 10   1726
      MAXBND 11   1727
      MAXBND 12   1728
      MAXBND 13   1729
      MAXBND 14   1730
      MAXBND 15   1731
      MAXBND 16   1732
      MAXBND 17   1733
      MAXBND 18   1734
      MAXBND 19   1735
      MAXBND 20   1736
      MAXBND 21   1737
      MAXBND 22   1738
      MAXBND 23   1739
      JJ 45    1740
      MAXBND 25   1741
      MAXBND 26   1742
      MAXBND 27   1743
      MAXBND 28   1744
      MAXBND 29   1745
      MAXBND 30   1746
      MAXBND 31   1747
      MAXBND 32   1748
      MAXBND 33   1749
      MINDEG 2    1750
      MINDEG 3    1751
      MINDEG 4    1752
      MINDEG 5    1753
      MINDEG 6    1754
      MINDEG 7    1755
      MINDEG 8    1756
      MINDEG 9    1757
      MINDEG 10   1758
      MINDEG 11   1759
      MINDEG 12   1760
      MINDEG 13   1761
      MINDEG 14   1762
      MINDEG 15   1763
      MINDEG 16   1764
      MINDEG 17   1765
      DIAM 2     1766
      DIAM 3     1767
      DIAM 4     1768
      DIAM 5     1769
      DIAM 6     1770
      DIAM 7     1771
      DIAM 8     1772
      DIAM 9     1773
      DIAM 10    1774
      DIAM 11    1775
      DIAM 12    1776
      DIAM 13    1777
      DIAM 14    1778
      DIAM 15    1779
      DIAM 16    1780
      DIAM 17    1781
      DIAM 18    1782
      DIAM 19    1783
      DIAM 20    1784
      DIAM 21    1785
      DIAM 22    1786
      DIAM 23    1787
      DIAM 24    1788
      DIAM 25    1789
      DIAM 26    1790
      DIAM 27    1791
      DIAM 28    1792
      DIAM 29    1793
      DIAM 30    1794
      DIAM 31    1795
      RELABL 2    1796
      RELABL 3    1797
      RELABL 4    1798
      RELABL 5    1799
      RELABL 6    1800

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C      NEW(NEW)=OLD, THE INVERSE OF ILD          RELABL 7   1801
DIMENSION IG(III,1),IC(1),IDEG(1),IDIS(1),IW(1),ICC(1)  RELABL 8   1802
DIMENSION ILD(1)          RELABL 9   1803
COMMON /S/ NN,MM,IH,IB          RELABL10  1804
INTEGER X          RELABL11  1805
COMMON /A/ MAXGRO          RELABL12  1806
COMMON /BITS/ NBITIN,NBITEX,IPASS          RELABL13  1807
DIMENSION NODES( 1),IAJ(50)          RELABL14  1808
I=NODES(1)          RELABL15  1809
ICN=IC(1)          RELABL16  1810
NT=ICC(ICN)-1          RELABL17  1811
DO 50 I=1,NN          RELABL18  1812
IF(IC(I)-ICN) 50,40,50          RELABL19  1813
40    IDIS(I)=0          RELABL20  1814
50    CONTINUE          RELABL21  1815
      DO 100 J=1,NS          RELABL22  1816
      JJ=NODES(J)          RELABL23  1817
      IDIS(JJ)=-1          RELABL24  1818
      JT=J+NT          RELABL25  1819
      NEW(JT)=JJ          RELABL26  1820
100   ILD(JJ)=JT          RELABL27  1821
      KI=NT          RELABL28  1822
      KO=NS+NT          RELABL29  1823
      LL=KO          RELABL30  1824
      L=1          RELABL31  1825
      J=KO          RELABL32  1826
      NNC=ICC(ICN+1)-1          RELABL33  1827
130   KI=K+1          RELABL34  1828
      IF(KI-LL) 135,132,135          RELABL35  1829
132   L=L+1          RELABL36  1830
      LL=KO+1          RELABL37  1831
135   II=NEW(KI)          RELABL38  1832
      N=IDEG(II)          RELABL39  1833
      IF(N) 140,255,140          RELABL40  1834
140   IJ=0          RELABL41  1835
      DO 200 I=1,N          RELABL42  1836
      IA = IL(II,I)          RELABL43  1837
      IF(IDIS(IA)) 200,150,200          RELABL44  1838
150   IJ=IJ+1          RELABL45  1839
      IDIS(IA)=L          RELABL46  1840
      KO=KO+1          RELABL47  1841
      IAJ(IJ)=IA          RELABL48  1842
      IW(IJ)=IDEG(IA)          RELABL49  1843
200   CONTINUE          RELABL50  1844
      IF(IJ-1) 250,210,220          RELABL51  1845
210   J=KO          RELABL52  1846
      IZ=IAJ(1)          RELABL53  1847
      NEW(KO)=IZ          RELABL54  1848
      ILD(IZ)=KO          RELABL55  1849
      GO TO 250          RELABL56  1850
220   X=0          RELABL57  1851
221   DO 230 I=2,IJ          RELABL58  1852
      IF(IW(I)-IW(I-1)) 224,230,230          RELABL59  1853
224   CONTINUE          RELABL60  1854
      X=IW(I)          RELABL61  1855
      IW(I)=IW(I-1)          RELABL62  1856
      IW(I-1)=X          RELABL63  1857
225   X=IAJ(I)          RELABL64  1858
      IAJ(I)=IAJ(I-1)          RELABL65  1859
      IAJ(I-1)=X          RELABL66  1860
230   CONTINUE          RELABL67  1861
      IF(X) 235,235,220          RELABL68  1862
235   DO 240 I=1,IJ          RELABL69  1863
      J=J+1          RELABL70  1864
      IZ=IAJ(I)          RELABL71  1865
      NEW(J)=IZ          RELABL72  1866
      ILD(IZ)=J          RELABL73  1867
240   CONTINUE          RELABL74  1868
250   IF(KO-NNC) 130,255,255          RELABL75  1869
255   CONTINUE          RELABL76  1870
      RETURN          RELABL77  1871
      END          RELABL78  1872
      FUNCTION IDIST(NS,ML,MAXLEV,IG,III,IC,IDEG,IDIS,IW,ICC)
C THIS FUNCTION HAS AS ITS VALUE THE MAXIMUM DISTANCE OF ANY NODE          IDIST 2   1873
C           IN COMPONENT IC(NS) FROM THE NODE NS.          IDIST 3   1874
C THE DISTANCE OF EACH NODE IN THIS COMPONENT IS STORED IN THE ARRAY          IDIST 4   1875
C           IDIS.          IDIST 5   1876
C THE MAXIMUM NUMBER OF NODES AT THE SAME DISTANCE FROM NS IS          IDIST 6   1877
C           STORED IN ML.          IDIST 7   1878
      DIMENSION IG(III,1),IC(1),IDEG(1),IDIS(1),IW(1),ICC(1)          IDIST 8   1879
      COMMON /S/ NN,MM,IH,IB          IDIST 9   1880
      COMMON /A/ MAXGRO          IDIST 10  1881
      COMMON /BITS/ NBITIN,NBITEX,IPASS          IDIST 11  1882
      ICN=IC(NS)          IDIST 12  1883
      NNC=ICC(ICN+1)-ICC(ICN)          IDIST 13  1884
      DO 50 I=1,NN          IDIST 14  1885
      IF(IC(I)-IC(NS)) 50,40,50          IDIST 15  1886
40    IDIS(I)=0          IDIST 16  1887
50    CONTINUE          IDIST 17  1888
      LL=1          IDIST 18  1889
      L=0          IDIST 19  1890
      KI=0          IDIST 20  1891
      KO=1          IDIST 21  1892
      ML=0          IDIST 22  1893
      IW(1)=NS          IDIST 23  1894
      IDIS(NS)=-1          IDIST 24  1895
130   KI=KI+1          IDIST 25  1896
      IF(KI-LL) 135,132,135          IDIST 26  1897
132   L=L+1          IDIST 27  1898
      LL=KO+1          IDIST 28  1899
135   CONTINUE          IDIST 29  1900

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K=KO-KI+1	IDIST 30	1901
IF(K-ML) 135,135,133	IDIST 31	1902
133 ML=K	IDIST 32	1903
IF(ML-MAXLEV) 135,135,220	IDIST 33	1904
135 II=IW(KI)	IDIST 34	1905
N=IDEG(II)	IDIST 35	1906
IF(N)140,215,140	IDIST 36	1907
140 DO 200 I=1,N	IDIST 37	1908
IA = IG(II,I)	JJ 47	1909
IF(IDIS(IA))200,150,200	IDIST 39	1910
150 IDIS(IA)=L	IDIST 40	1911
KO=KO+1	IDIST 41	1912
IW(KO)=IA	IDIST 42	1913
200 CONTINUE	IDIST 43	1914
IF(KO-NNC)130,205,205	IDIST 44	1915
205 IDIST=L	IDIST 45	1916
IDIS(NS)=U	IDIST 46	1917
K=KO-KI	IDIST 47	1918
IF(K-ML) 206,206,207	IDIST 48	1919
207 ML=K	IDIST 49	1920
206 CONTINUE	IDIST 50	1921
RETURN	IDIST 51	1922
215 L=0	IDIST 52	1923
GO TO 205	IDIST 53	1924
220 IDIST=1	IDIST 54	1925
RETURN	IDIST 55	1926
END	IDIST 56	1927
SUBROUTINE REMARK(A)	JJ 48	1928
RETURN	JJ 49	1929
END	JJ 50	1930
FUNCTION EOF(I)	JJ 51	1931
INTEGER EOF	JJ 52	1932
EOF=0	JJ 53	1933
RETURN	JJ 54	1934
END	JJ 55	1935

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1. ORIGINATING ACTIVITY (Corporate author) Naval Ship R&D Center Bethesda, Maryland 20034		2a. REPORT SECURITY CLASSIFICATION UNCLASSIFIED
		2b. GROUP
3. REPORT TITLE The BANDIT Computer Program for the Reduction of Matrix Bandwidth for NASTRAN		
4. DESCRIPTIVE NOTES (Type of report and inclusive dates) Research and Development Report		
5. AUTHOR(S) (First name, middle initial, last name) Gordon C. Everstine		
6. REPORT DATE March 1972	7a. TOTAL NO. OF PAGES 74	7b. NO. OF REFS 4
8a. CONTRACT OR GRANT NO.	9a. ORIGINATOR'S REPORT NUMBER(S) Report 3827	
b. PROJECT NO. ZR 0140201	9b. OTHER REPORT NO(S) (Any other numbers that may be assigned this report)	
c.		
d.		
10. DISTRIBUTION STATEMENT Approved for public release; distribution unlimited.		
11. SUPPLEMENTARY NOTES	12. SPONSORING MILITARY ACTIVITY Naval Ship R&D Center Technical Director Bethesda, Maryland 20034	
13. ABSTRACT <p>This report describes a matrix bandwidth reduction preprocessor for use with the NASA structural analysis computer program, NASTRAN. Called BANDIT, the program is written in FORTRAN and uses the Cuthill-McKee strategy for resequencing grid points. Versions of the program for both CDC and other computers are presented.</p>		

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14 KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
NASTRAN Finite Element Analysis Matrix Methods Bandwidth Reduction BANDIT Matrix Bandwidth Reduction Structural Analysis-Computer Methods						